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Catalogue of Challenges, Opportunities,
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for Mobility and Agrifood

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D2.4 – Catalogue of Challenges, Opportunities, Enablers and Blockers of Just Twin Transition for Mobility and Agrifood

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- R: Document, report (excluding the periodic and final reports)
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² **Dissemination level:** Use one of the following codes (in consistence with the Description of the Action)

- PU: Public, fully open, e.g. web
- SEN: Sensitive, limited under conditions of the Grant Agreement

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Summary

This document constitutes Deliverable D2.4 of the READJUST project (Horizon Europe Grant Agreement no. 101132562), produced by 4CF under Work Package 2. It presents a structured catalogue of the challenges, opportunities, enablers and blockers of a Just Twin Transition in the Mobility and Agrifood sectors, developed through a participatory foresight and justice-lensing process anchored in the four 2050 scenarios produced in D1.6.

The catalogue was generated through a three-phase process: (1) an expert Inequality Intensity Matrix deployed via 4CF HalnyX to measure how severely seven categories of inequality manifest across the four scenarios; (2) a Justice Lensing exercise applying six dimensions of justice (Kaljonen et al., 2024) to identify and structure challenges, opportunities, enablers and blockers across both sectors; and (3) a collaborative online validation workshop with READJUST partners using a Traffic Light Review method to assess internal consistency and cross-sectoral significance.

The key findings are threefold. First, inequality risks are not evenly distributed across futures: the Fragmented Efficiency scenario generates the most severe inequalities across both sectors, particularly around digital access, socio-economic barriers and environmental exposure, while the Deliberative Commons scenario offers the strongest structural protections, albeit with its own vulnerabilities around spatial starting points and the cost of consensus. Second, several challenges prove universal across all four scenarios: the risk of algorithmic disempowerment (loss of human agency to opaque automated systems), the structural need for reskilling of workers and communities, and the tension between efficiency-driven market governance and equitable access. Third, the most powerful enablers identified - universal access protocols, transparent algorithmic governance, inclusive re-education programmes and bioregional self-sufficiency - are precisely those that require the most deliberate, proactive policy design. Left to market dynamics alone, they do not materialise.

The catalogue is structured to directly feed Tasks T4.3 (Policy Options) and T4.5 (Roadmap Stress-Testing) of WP4, providing the evidence base for formulating resilient, justice-informed policy recommendations for the twin transition.

1 Introduction

This deliverable addresses a fundamental gap in twin transition policy-making: while the green and digital transitions are reshaping European societies at an unprecedented pace, the justice implications of these changes, who benefits, who bears the costs, and who is left behind, remain underexplored in actionable policy terms. D2.4 fills this gap by offering a structured, participatory catalogue of the challenges, opportunities, enablers and blockers that policymakers, civil society and researchers can use to design, assess and stress-test just transition policies in two sectors: Mobility and Agrifood. The catalogue was developed through a three-phase participatory process combining expert elicitation, analytical justice lensing and multi-partner validation, described in detail in Section 2.

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The four scenarios, developed through a rigorous multi-stage foresight process in D1.6, represent distinct plausible futures for the twin transition in Europe by 2050. Fragmented Efficiency depicts a market-led transition where technological progress is confined to wealthy ‘Green Zones’, creating a new class of ‘climate poor’. The Managed Utopia envisions a centrally governed, technocratically efficient Europe where climate goals are achieved at the cost of individual autonomy and pervasive surveillance. The Mosaic of Resilience portrays a radically decentralised Europe of autonomous bioregions and local foodsheds, emerging after the collapse of centralised systems. The Deliberative Commons describes an equitable, consensus-driven transformation that prioritises well-being and ecological regeneration, but progresses slowly due to its reliance on participatory governance. These scenarios function not as predictions but as ‘wind tunnels’, stress-testing environments for policy assessment.

The twin transition is reshaping European economies, food systems and mobility infrastructure at a speed and scale without precedent. While the policy ambition behind this transformation is to achieve a greener and more equitable Europe, the READJUST project is grounded in a recognition that these transitions are not neutral: they carry inherent risks of exacerbating existing inequalities and generating new ones, particularly for the most vulnerable groups and regions.

This deliverable translates the strategic foresight work of WP1 into a structured, policy-actionable knowledge base.

The catalogue serves two principal functions within the READJUST architecture. First, it enriches the READJUST Inequality Observatory (WP2) with a scenario-grounded, participatory layer of analysis, connecting future-oriented risk mapping to the empirical inequality evidence base. Second, it provides the direct input for WP4's policy development work: the identified challenges and opportunities inform T4.3 (Policy Options), while also providing the basis and stress-testing material for T4.5 (Roadmap Stress-Testing using the D1.6 scenarios as wind tunnels).

The document is organised as follows. Section 2 describes the methodology underpinning the catalogue's development. Section 3 presents the results of the Inequality Intensity Matrix, offering a quantitative overview of inequality risks across sectors and scenarios. Section 4 constitutes the core catalogue, structured by sector and justice dimension. Section 5 maps the vulnerable groups identified through the process. Section 6 draws conclusions and articulates implications for WP4.

2 Methodology

The methodology underpinning D2.4 was designed to move beyond generic risk identification towards a participatory, justice-literate, and scenario-grounded analysis. It comprised three sequential phases.

The methodology is best understood as a participatory scenario assessment exercise, a structured process for evaluating the justice implications of four plausible futures using expert knowledge, analytical frameworks and multi-partner deliberation. The process unfolded in three sequential phases, each with a distinct epistemic goal: Phase I resulted in an expert-based signal of which inequality categories are most at risk in each scenario as well as their direct and indirect implications for each of six justice dimensions; Phase II translated those signals into a structured,

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rich catalogue of challenges, opportunities, enablers and blockers; and Phase III (validation workshop) quality-assured the catalogue and surfaced cross-cutting interlinkages.

2.1 Phase I: Inequality Intensity Matrix (4CF HalnyX)

The first phase deployed a structured expert elicitation exercise via 4CF HalnyX, a dedicated online foresight platform. Participants, representing expertise in mobility and agrifood sectors (20 experts across all scenarios), drawn from the READJUST consortium and its expert network, were presented with a matrix in which rows represented seven pre-identified categories of inequality (derived from D1.1 and D1.3) and columns represented the four 2050 scenarios from D1.6. For each cell, participants assigned an intensity score on a four-point scale: Very High (4), High (3), Moderate (2), or Low (1), as can be seen on Figure 1.



Figure 1. Inequality Intensity Matrix - 4CF HalnyX survey.

The inequality categories were: Digital Divide (access to digital technologies, mobility services and infrastructure), Socio-economic Barriers (affordability), Planning/Market Impact (power imbalances between large agribusinesses and small farms, risk of misuse of mobility data), Labour Market Effects (skills, exploitation and displacement), Spatial Inequalities (rural vs. urban), Environmental Effects (exposure to polluted air or noise and pollution of soil), and Horizontal Inequalities (due to age, gender, ethnicity, disability, language, etc.).

Scores were averaged across respondents to produce sector-level and scenario-level intensity ratings, presented in Section 3.

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2.2 Phase II: Justice Lensing

For each scenario, participants of the survey on the 4CF HalnyX have been answering three nested questions based on six dimensions of justice as articulated by Kaljonen et al. (2024):

- Distributive Justice - fair distribution of benefits and burdens, including rights to basic needs and compensation of unfair harms;
- Recognition Justice - socio-cultural dignity, respect for differences, and non-discrimination;
- Capacity Justice - equal capacity of actors to respond to transition demands, including access to innovation and collective agency;
- Ecological Integrity and Animal Justice - recognition of nature and non-human animals, impacts on ecosystems and biodiversity;
- Cosmopolitan Justice - global fairness, intergenerational justice, and protection of future generations' opportunities;
- Procedural Justice - transparent, inclusive decision-making processes and equitable access to reliable information.

The questions were:

- Question A (Implications): "What are the specific implications for [e.g., Procedural Justice] in this scenario?"
- Question B (Second Order Implications): "What are the subsequent implications for [e.g., Procedural Justice] in this scenario?"
- Question C (Vulnerability Mapping): "Based on the implications identified, which groups are uniquely or most severely vulnerable?" (e.g., identifying the "Autonomy Deficient" or "Protocol Excluded" groups).

The raw implications from the HalnyX exercise were subsequently processed internally by the task team. For each justice dimension, in each sector, the analytical team identified and structured: Blockers (structural factors that hinder just outcomes), Enablers (factors that actively facilitate just outcomes), Challenges (key risks or tensions that require policy attention), and Opportunities (positive pathways opened by the transition that can be leveraged for justice).

This four-fold structure (Blockers / Enablers / Challenges / Opportunities) constitutes the organising logic of the Catalogue presented in Section 4.

2.3 Phase III: Validation Workshop

The outputs of Phase II were presented to a panel of READJUST consortium partners in a structured online validation workshop. The workshop was attended by 10 READJUST consortium members. The workshop agenda comprised two exercises.

Exercise 1 (Validation) applied a Traffic Light Review method: participants assessed each challenge and opportunity against two criteria - internal consistency (whether the framing was logically coherent) and significance (relevance for the justice dimension and the sector). Green cards signalled endorsement, yellow cards indicated suggested revisions or caveats, and red cards flagged fundamental inconsistencies requiring reformulation.

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Exercise 2 (Linkages Detection) invited participants to identify horizontal connections between challenges and opportunities across different justice dimensions. These interlinkages are captured in Section 4.3.

Following the workshop, the catalogue was revised to reflect validator feedback, including the reformulation of entries that received red or yellow cards and the incorporation of additional nuance where validators identified gaps. Entries that received broad green endorsement are presented substantially as they emerged from Phase II.

3 Inequality Intensity Analysis

The Inequality Intensity Matrix generated a structured, quantitative overview of how severely different categories of inequality are expected to manifest across the four 2050 scenarios in each sector. The results are presented in Tables 1 and 2 below.

3.1 Key Findings: Mobility Sector

Table 1. Inequality Intensity Heat Map – Mobility Sector

VH = Very High (4) | H = High (3) | M = Moderate (2) | L = Low (1) | – = no data collected

| Inequality Type | Fragmented Efficiency | Managed Utopia | Mosaic of Resilience | Deliberative Commons | Avg. |
|--------------------------|-----------------------|----------------|----------------------|----------------------|------|
| Digital Divide | H | M | M | M | 2.25 |
| Socio-economic Barriers | VH | L | H | M | 2.5 |
| Planning / Market Impact | M | L | M | L | 1.5 |
| Labour Market Effects | H | L | L | L | 1.5 |
| Spatial Inequalities | M | L | L | VH | 2 |
| Environmental Effects | M | L | L | L | 1.33 |
| Horizontal Inequalities | M | L | M | M | 1.75 |

Across the Mobility sector, Socio-economic Barriers (average intensity 2.5) and the Digital Divide (2.25) emerge as the most structurally severe inequality risks. This reflects the fundamentally tiered nature of sustainable mobility technologies: electric vehicles, autonomous transport hubs and MaaS platforms all carry high upfront costs and digital literacy requirements, creating a structural access gap that market forces alone are unlikely to bridge.

Spatial Inequalities present a notably uneven profile across scenarios: while appearing at moderate or low levels in Fragmented Efficiency and Mosaic of Resilience, they spike to VERY HIGH in the Deliberative Commons. This counterintuitive finding reflects the deliberative model's structural tension between universal access aspirations and the slow, consensus-driven pace of infrastructural change, which risks leaving rural and peripheral areas chronically underserved despite the system's equity orientation.

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These intensity patterns reflect the defining logic of each scenario. In Fragmented Efficiency, market-led governance and corporate capture explain the very high scores for socio-economic barriers and digital divide: access to sustainable technologies functions as a filter concentrating benefits among the wealthy. In the Deliberative Commons, the paradoxically high spatial inequality score reflects not neglect but governance inertia: the slow consensus-driven infrastructure rollout leaves peripheral areas underserved despite the system's equity intentions. Environmental Effects register the lowest average score (1.33), suggesting that mobility-related environmental inequality, while real, is perceived as more tractable relative to socio-economic and digital access risks. Labour Market Effects and Horizontal Inequalities both score at MODERATE level indicating a steady, cross-scenario concern for displacement of logistics workers and the differential impacts on age, disability and ethnicity groups.

3.2 Key Findings: Agrifood Sector

Table 2. Inequality Intensity Heat Map – Agrifood Sector

VH = Very High (4) | H = High (3) | M = Moderate (2) | L = Low (1) | – = no data collected

| Inequality Type | Fragmented Efficiency | Managed Utopia | Mosaic of Resilience | Deliberative Commons | Avg. |
|----------------------------|-----------------------|----------------|----------------------|----------------------|------|
| Digital Divide | H | M | L | M | 2 |
| Socio-economic Barriers | VH | L | M | M | 2.25 |
| Market-driven Inequalities | VH | M | L | VH | 2.75 |
| Labour Market Effects | VH | VH | M | M | 3 |
| Spatial Inequalities | H | VH | M | H | 3 |
| Environmental Effects | VH | L | M | M | 2.25 |
| Horizontal Inequalities | VH | H | L | H | 2.75 |

The Agrifood sector presents a more uniformly severe inequality profile, with six of seven categories registering average scores at or above 2. Spatial Inequalities and Labour Market Effects (both 3) are the highest-ranked concerns, reflecting the combination of persistent rural-urban divide, particularly those in the Managed Utopia scenario where soil exploitation and pollution are unmitigated, and the profound structural disruption that digital agriculture and alternative protein systems pose to rural employment.

Market-driven Inequalities score consistently VERY HIGH in Fragmented Efficiency, capturing the concentration of data, land and technology in the hands of a small number of agri-tech corporations, a dynamic described in the qualitative catalogue as 'tech-feudalism'.

Taken together, the intensity matrix confirms that the Fragmented Efficiency scenario generates the most acute inequality risks across both sectors, while the Mosaic of Resilience, despite its decentralised, community-based architecture, continues to present moderate inequality risks,

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particularly around digital access and spatial disparities. These patterns directly shape the challenge and opportunity framing in the Catalogue that follows.

4 Catalogue of Challenges, Opportunities, Enablers and Blockers

The quantitative Inequality Intensity Matrix presented in Section 3 established which categories of inequality face the most severe risks across the four scenarios. This section translates those quantitative figures into a qualitative, justice-structured catalogue, explaining not just how intense the risks are, but what form they take, what drives them, what could mitigate them, and what policy opportunities they open. The scenarios from D1.6 continue to provide the analytical backdrop throughout: challenges and opportunities are interpreted in light of the four futures, though the catalogue is structured by justice dimension rather than by scenario, to allow direct uptake by WP4 policy development.

This section constitutes the core deliverable of D2.4. The catalogue is structured in three parts: the Agrifood sector (4.1), the Mobility sector (4.2), and cross-cutting themes and interlinkages (4.3). Within each sector, findings are organised by the six justice dimensions of Kaljonen et al. (2024). Each entry presents the Blockers and Enablers identified through the justice lensing process, followed by the overarching Challenge and Opportunity that synthesise the key policy-relevant tensions and pathways. All substantial validator feedback has been incorporated into the formulation.

4.1 Agrifood Sector

4.1.1 Distributive Justice

Fair distribution of benefits and burdens, including rights to basic needs, employment and livelihood impacts, and alleviation of unfair harms.

BLOCKERS

- **Elite Accumulation:** The concentration of high-quality, traditionally produced food as a luxury good for the wealthy, while the majority consumes synthetic, lab-grown or insect-based alternatives.
- **Corporate Monopoly:** CEO-led control over the food supply chain, progressively turning national governments into regulatory 'puppets' unable to enforce redistributive standards.
- **The Luxury Gap:** A two-tier food system in which access to 'real' or culturally recognised food becomes a function of purchasing power rather than nutritional need.

ENABLERS

- **Universal Basic Services:** Expanding UBI (Universal Basic Income) or public food programmes to cover high-quality, nutritious food, not merely minimum caloric survival rations.
- **Fair Resource Redistribution:** Decentralising land ownership and technological tools to prevent 'tech-feudalism' and preserve small-farm viability.

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CHALLENGE

The Rise of Tech-Feudalism. The digital dimension of the twin transition carries a critical risk of centralising wealth, data and control in the hands of a small number of agri-tech corporations. Without deliberate regulatory intervention, farmers risk becoming 'digital sharecroppers', data providers with no ownership of, or benefit from, the intelligence generated by their operations. The benefits of efficiency accrue to platform owners rather than to farming communities or consumers. This challenge is most acute in the Fragmented Efficiency scenario but appears structurally in all futures where data governance is left to market dynamics. Validator note: the severity of this challenge depends critically on who owns the data, making data governance policy the pivotal intervention.

OPPORTUNITY

Tech-Driven Food Sovereignty. Precision agriculture and automated logistics carry genuine potential to transform high-quality, nutritious food into a universally guaranteed public service, a 'Universal Basic Food' that practically eliminates nutritional poverty. However, this opportunity does not materialise automatically: it requires a fundamental shift in the economic architecture of food systems, moving from profit-maximising platforms towards systems designed for public benefit. Technology is the enabler, not the driver. Where governance ensures public ownership or strong regulation of agricultural AI and data, this opportunity becomes realisable.

4.1.2 Recognition Justice

Socio-cultural dignity and respect for differences, including non-discrimination and the representation of marginalised groups in decision-making.

BLOCKERS

- Urban-Centric Hegemony: The systematic stigmatisation of rural folk culture and traditional agricultural practice as 'inferior', 'backward' or 'responsible' for past climate failures.
- Forced Homogenisation: The erasure of cultural diversity in food systems in the name of efficiency, a 'Brave New World' approach to nutrition that eliminates culinary heritage and local identity.

ENABLERS

- Cultural Heritage Valorisation: Reframing traditional agriculture not as an obstacle to progress but as a source of social capital, community identity and ecological wisdom.
- Pluralistic Knowledge: Integrating local and indigenous farming knowledge with high-tech biosensing and precision agriculture, rather than displacing one with the other.

CHALLENGE

Cultural Stigmatisation. Rural residents risk being unfairly labelled as 'climate laggards' or 'eco-guilty', cast as the obstacle to, rather than partners in, the just transition. This stigmatisation erases folk cultures and traditional agricultural identities in favour of a homogenised, urban-centric 'green' lifestyle. The challenge is particularly sharp in scenarios where rapid, technology-led transformation leaves little room for cultural negotiation. Validator note: the specific framing

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of 'rural dwellers' requires careful handling in policy communication, the challenge is about power dynamics and narrative, not inherent rural conservatism.

OPPORTUNITY

Rural Identity Renaissance. By reframing traditional farming as cultural heritage and integrating it with ecological restoration, rewilding, agro-forestry, regenerative agriculture, the twin transition can restore dignity and social agency to rural communities. This opportunity is most powerful when the digital transition is deployed not to displace traditional knowledge but to amplify it: digital tools helping small farmers document, share and build on inherited ecological expertise. Validators highlighted that the combination of digital and green transitions is precisely what makes this opportunity distinctive.

4.1.3 Capacity Justice

Equal capacity of actors to engage with and adapt to the transition, including access to innovation, collective action and decision-making.

BLOCKERS

- The Digital Gap: The pace of technological change in agrifood leaves older generations and rural communities without the means to adapt, creating a structural capacity deficit that compounds over time.
- Technocratic Fatalism: A system in which individual agency is so marginalised that farmers internalise powerlessness, feeling unable to influence the global food system regardless of their actions.

ENABLERS

- Inclusive Re-education: Comprehensive, targeted reskilling programmes designed specifically for the digitally excluded, enabling them to manage AI-driven farming systems rather than be displaced by them.
- Regional Autonomy: Empowering local communities and regional 'nodes' to develop transition paths adapted to their specific contexts, whether conservative or progressive, rather than imposing a single national template.

CHALLENGE

Technocratic Disempowerment. The complexity of the twin transition risks creating a 'Tech-Feudal' system in which the average farmer is reduced to a passive data-provider for large AI platforms, stripped of individual agency and influence. This challenge is structurally linked to the data ownership question identified under Distributive Justice: if the farmer does not own the data generated by their operation, they cannot leverage it for collective action or negotiation. The disempowerment is simultaneously economic (loss of bargaining power) and epistemic (dependence on systems one does not understand). Validators confirmed that this challenge and its corresponding opportunity are both valid and of high policy relevance.

OPPORTUNITY

Digital Empowerment and Reskilling. The transition provides a historically significant platform for large-scale capacity building. If managed with equity as a design principle, rather than an afterthought, it can empower previously marginalised actors (small-scale farmers, rural youth,

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migrant agricultural workers) with the digital tools to manage local food nodes autonomously. The key governance question, flagged by validators, is whether this empowerment is 'managed well by the government', pointing to the need for strong public investment in transition-ready education systems.

4.1.4 Ecological Integrity and Animal Justice

Recognition of nature and non-human animals, respectful treatment of sentient animals, and protection of ecosystems and biodiversity.

BLOCKERS

- **Luxury Wildlife:** The restriction of access to thriving natural ecosystems to ultra-wealthy elites, while the majority live in ecologically depleted or highly synthetic environments.
- **Standardised Rewilding:** The imposition of 'one-size-fits-all' ecological restoration policies that ignore regional biodiversity differences and local ecological knowledge.
- **The Nature Skills Gap:** A society so physically and cognitively detached from the land, through urbanisation, allergies, digital intermediation, that it cannot meaningfully engage with restored ecosystems.

ENABLERS

- **Regenerative Rewilding:** Active, participatory land restoration that reintroduces local flora and fauna and progressively ends industrial-scale animal husbandry.
- **Ecosystem Symbiosis:** The integration of business objectives with biological stability, ensuring that commercial agrifood operations actively contribute to long-term environmental health.
- **Molecular and Modern Farming:** The deployment of precision fermentation, cellular agriculture and biosensing technologies to eliminate industrial-scale animal cruelty while restoring biodiversity at scale.

CHALLENGE

Ecological Apartheid. There is a structural risk that 'pristine nature' becomes a luxury asset, ecological integrity restored only within elite 'green zones' or corporate-managed territories, while the majority of the population lives in ecologically depleted or wholly synthetic environments. Validators confirmed that pristine nature becoming a luxury is a credible and important risk. However, they noted that corporate-managed territories do not automatically guarantee ecological integrity, and that larger systemic environmental challenges, ocean warming and atmospheric tipping points, render any 'green zone' architecture fundamentally fragile.

OPPORTUNITY

Ending Industrial Cruelty. The twin transition creates the technological and social conditions for the mass adoption of alternative proteins - lab-grown, plant-based, fermentation-derived - and for the deployment of precision biosensing across agricultural land. If these technologies are governed for public benefit, this could lead to the historic elimination of industrial-scale animal suffering and a surge in biodiversity through smart, participatory land restoration. This represents one of the most profound ecological opportunities embedded in the transition.

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4.1.5 Cosmopolitan Justice

Global fairness, intergenerational equity, and the protection of future generations' rights to well-being.

BLOCKERS

- **Generational Castes:** The hardening of social divisions into hereditary systems in which birth determines access to the green and digital food economy, eliminating intergenerational mobility.
- **Isolationist Resilience:** High-tech agricultural nodes thriving in isolation while ignoring the social and technological exclusion of communities outside the system, a structural indifference to global solidarity.

ENABLERS

- **Global Tech Transfer:** Active policies to ensure that sustainable agrifood models developed in Europe are shared equitably with the Global South, preventing the 'export of ecological exclusion'.
- **Open Integration:** Lowering barriers for migrants and communities from peripheral regions to enter and contribute to successful agricultural nodes.
- **Intergenerational Security:** Designing agrifood systems around long-term ecological and social stability rather than short-term corporate profitability.

CHALLENGE

The Creation of Parallel Worlds. If the transition proceeds unevenly, it risks cementing a global 'caste system' in which those inside the high-tech green food economy thrive, while those on the periphery, in the Global South, in rural outcasts, in economically marginalised communities, face total social and technological exclusion. This exclusion is not merely economic: it translates into differential life expectancy and generational foreclosure of opportunity.

OPPORTUNITY

Transparent Global Chains. Blockchain and digital twin technologies create the technical infrastructure for ensuring that food production anywhere in the global supply chain, including in the Global South, is managed to the same labour and ecological standards as in Europe. This offers a path to ending the export of environmental and social harm embedded in European food consumption, transforming global food chains from extractive to regenerative.

4.1.6 Procedural Justice

Transparent, inclusive decision-making processes, equitable policy implementation, and access to reliable information.

BLOCKERS

- **Neuro-Management:** The use of 'social re-education', algorithmic nudging and surveillance technologies to suppress individual dissent and enforce collective compliance with transition mandates.

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- Illusion of Agency: The deployment of digital 'participation' tools that function as internal propaganda, giving citizens the illusion of voice while real decisions are made by hidden technocratic elites or autonomous algorithms.

ENABLERS

- Bottom-Up Regionalism: Giving local communities direct, enforceable power over agricultural 'protocols', land-use decisions and food system governance.
- Transparent Algorithmic Governance: Making the AI-led management of food systems auditable and subject to genuine public deliberation - not merely a technical oversight.

CHALLENGE

The Illusion of Participation. Advanced technology can be deployed to mask a centralisation of power, rather than distribution. Through 'success propaganda', or algorithmic nudging, systems may give citizens the feeling of meaningful control while real decisions are made by opaque technocratic elites or self-optimising algorithms. This challenge is particularly acute in the Managed Utopia scenario, but it is structurally present wherever participation tools are designed primarily to maintain social stability rather than genuinely distribute power.

OPPORTUNITY

Hyper-Local Participatory Governance. Digital tools and AI can, under the right governance conditions, facilitate 'liquid democracy' or distributed decision-making in agrifood systems, allowing every citizen, from migrant agricultural workers to small-scale farmers, to have a direct, transparent and real-time say in how their local food system is managed. Validators noted productive ambiguity in this opportunity: whether 'swarm-like' decision-making is ultimately democratising or homogenising depends entirely on the design of the participation architecture.

4.2 Mobility Sector

4.2.1 Distributive Justice

Fair distribution of benefits and burdens of the mobility transition, including rights to basic mobility, employment impacts, and spatial equity.

BLOCKERS

- The Green Silo Effect: High-tech, sustainable mobility, electric vehicles, autonomous hubs, premium MaaS platforms, becoming an exclusive amenity for corporate elites and wealthy urban districts.
- The Digital Paywall: Access to low-carbon transport requiring expensive hardware or high-speed data connectivity that lower-income groups cannot afford, creating a structural exclusion from the green mobility economy.

ENABLERS

- Universal Access Protocols: The implementation of 'root code' standards that guarantee a basic level of sustainable mobility as a right rather than a luxury, ensuring interoperability and minimum access across all service tiers.

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- Automated Redistribution: AI systems managing Universal Basic Income or mobility credits to dynamically subsidise transport access for underserved regions and populations.
- Renaissance of Self-Development: Designing free time generated by automation not as a social problem but as a resource for community-driven learning and reskilling.

CHALLENGE

The Digital-Green Paywall. The technologies at the core of the sustainable mobility transition, electric vehicles, autonomous transport hubs, AI-managed logistics, carry high upfront costs and require digital literacy that lower-income groups frequently lack. Without deliberate structural intervention, this creates a future in which high-quality, low-carbon mobility is concentrated in 'Green Zones', while other communities face systemic transport deprivation. Validators confirmed that high upfront costs are already empirically evident in case studies (including Helsinki), and noted a significant legislative gap in adapting to new platform economies within logistics, particularly around fair compensation and new forms of labour in automated supply chains.

OPPORTUNITY

Dynamic Equity Redistribution. Digital systems, real-time data analytics, automated subsidy engines, mobility credit platforms, can be deployed to automatically subsidise transport access for underserved regions, ensuring the green transition in mobility does not replicate or deepen existing spatial inequalities. Validators highlighted the importance of going beyond regional redistribution to address the specific needs of different vulnerable groups, including logistics workers, elderly users, and people with disabilities, and noted that charging infrastructure in underserved areas is a critical gap that redistribution mechanisms must also address.

4.2.2 Recognition Justice

Socio-cultural dignity and respect for differences in mobility needs, identities and non-standard lifestyles.

BLOCKERS

- Algorithmic Homogenisation: AI systems that 'flatten' society by treating everyone as a mathematical average, ignoring the unique mobility needs of minorities, neurodivergent individuals and non-standard lifestyles.
- Socio-Cultural Stigma: The labelling of those who cannot or will not adapt to 'holographic' or 'digital-first' mobility as system liabilities - a form of structural discrimination embedded in transition design.

ENABLERS

- Inclusive Design Aligners: Using digital tools to specifically account for neurodiversity, cultural identities and non-standard behavioural patterns in transport planning, moving from universal averages to genuine inclusivity.
- Visibility of the Invisible: Using data systems to surface and address the mobility needs of rural populations, elderly users and non-corporate citizens who are structurally invisible in urban-centric planning models.

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CHALLENGE

Algorithmic Flattening. In the pursuit of 'mathematical equality', AI-driven mobility systems risk erasing human nuances - forcing a sterile, homogenous model that ignores non-standard lifestyles, cultural differences and diverse physical or cognitive capacities. Validators noted that the challenge and its corresponding opportunity partially overlap - they represent two sides of the same governance coin rather than wholly distinct outcomes. They also emphasised that the recognition justice in mobility is not solely an algorithmic design issue but fundamentally a participatory governance issue: who has a voice in defining the parameters of the system.

OPPORTUNITY

Inclusive Identity Aligners. Advanced digital tools can be actively programmed to recognise and prioritise the specific mobility needs of diverse groups, neurodivergent individuals, elderly users, disabled persons, cultural minorities, granting them a level of systemic dignity currently absent from most transport planning. Validators broadened this opportunity beyond neurodivergent individuals to encompass all groups with differentiated mobility needs, emphasising the general principle of design for diversity rather than design for the average.

4.2.3 Capacity Justice

Equal capacity of actors, including citizens, communities and workers, to engage with, shape and adapt to the mobility transition.

BLOCKERS

- The Time-Tax: Transition models that require constant, complex democratic participation, which unfairly penalise people who work long hours, have caregiving duties, or lack the cognitive bandwidth for sustained civic engagement.
- Atrophy of Agency: Over-reliance on hyper-automated 'Managed Utopia' systems where AI makes all mobility choices, leading to the progressive erosion of human problem-solving skills and spatial intelligence.

ENABLERS

- Open-Source Mobility Tools: Providing local communities with the 'root code' for transport innovation, enabling them to build contextually appropriate solutions rather than depending entirely on proprietary platforms.
- Frugal Innovation: Actively encouraging low-cost, high-impact social innovations that do not require massive capital investment, enabling community-led mobility solutions in resource-constrained contexts.
- Decentralised Decision-Making: Shifting governance power to local levels, giving citizens direct agency to shape their community's mobility transition rather than receiving it as a top-down service.

CHALLENGE

Cognitive Atrophy. Hyper-automated mobility systems risk eliminating human choice, navigational skill and spatial reasoning, creating a 'Time-Tax' in which only those with leisure and capital can afford meaningful participation in complex mobility planning processes. Validators noted that a parallel central challenge is 'digi-vulnerability': the difficulty of using

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digital interfaces for mobility access among people with limited digital skills, physical disabilities or economic constraints. They also flagged a potential connection between this challenge and procedural justice, noting that cognitive atrophy in mobility maps onto broader exclusion from participatory governance.

OPPORTUNITY

Frugal Grassroots Innovation. By shifting power to decentralised, local levels, the transition can leverage low-cost, community-generated innovations that emerge from lived mobility needs rather than top-down corporate technology deployment. This opportunity is especially significant for remote or disconnected areas where standard commercial mobility solutions are economically unviable. Validators confirmed the high significance of this opportunity for enabling local solutions in peripheral areas.

4.2.4 Ecological Integrity and Animal Justice

The ecological footprint of the mobility transition, including impacts on biodiversity, habitats and the intrinsic value of non-human species.

BLOCKERS

- Technological Instrumentalism: Treating nature as a system to be 'optimised' by AI rather than a living entity with intrinsic value, leading to algorithmically managed but ecologically sterile environments.
- Fragmented Eco-Standards: A 'mosaic' approach where adjacent communities apply radically different environmental standards, leading to localised ecological collapse and cross-boundary harm.
- AI Over-Optimisation: Disrupting natural evolutionary processes and ecosystem dynamics through overly rigid, algorithm-driven environmental management that prioritises efficiency over ecological complexity.

ENABLERS

- Holographic Substitution: Using high-fidelity virtual and holographic presence to reduce the volume of physical travel required for work, leisure and social connection, thereby reducing human encroachment on critical habitats.
- Bioregional Sufficiency: Shifting the governance objective from 'constant mobility growth' to 'ecological sufficiency' within locally defined transport loops, prioritising the minimum necessary mobility rather than maximising it.

CHALLENGE

Technological Instrumentalism. Treating nature as a 'system to be optimised' by AI risks fundamentally misunderstanding ecological complexity, disrupting evolutionary dynamics and natural chaos in favour of a 'tidy' but biologically impoverished model. Validators questioned the timescale relevance of this challenge for mobility specifically (whether mobility choices can meaningfully affect evolutionary processes in the relevant period), and noted that the challenge's focus on AI risks obscuring other digital technologies, autonomous vehicles, IoT infrastructure, data centres, that also have significant ecological footprints.

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OPPORTUNITY

Digital Dematerialisation. Prioritising high-fidelity digital substitution, VR environments, holographic communication, telepresence, for physical travel allows for massive rewilding of transport corridors, transitioning from a growth-obsessed to a bioregionally sufficient mobility model. Validators noted important caveats: rebound effects (AI optimisation may enable economic growth that drives increased mobility demand) and the risk that digital connectivity is framed as justification for continued economic expansion rather than genuine sufficiency.

4.2.5 Cosmopolitan Justice

Global fairness and intergenerational equity in the mobility transition, including impacts on the Global South and future generations.

BLOCKERS

- Green Protectionism: European self-sufficiency in mobility and logistics that inadvertently collapses the economies of Global South countries previously integrated into European trade and transport networks.
- Physical Nostalgia: Creating a 'mobility-poor' future generation that is digitally connected but physically confined, unable to travel, explore or build the cross-cultural experiences that physical mobility enables.

ENABLERS

- Global Virtual Hubs: Ensuring that as physical travel becomes more bioregional, deep cultural and familial ties across borders are maintained through progressively immersive digital connectivity.
- Intergenerational Legacy Planning: Designing mobility infrastructure and governance systems explicitly to preserve the possibility of meaningful travel and exploration for future generations.
- Beacon of Innovation: Positioning Europe as a leader of sustainable mobility innovation that actively supports the Global South in building its own green transport infrastructure.

CHALLENGE

Green Protectionism. A self-sufficient, green European mobility economy risks becoming a 'fortress', inadvertently collapsing the economies of Global South countries that previously relied on physical trade, logistics and travel links with the continent. Validators noted that total trade cessation is unlikely, Europe will remain dependent on raw materials and goods from other continents, but that the governance of this dependency matters enormously. They also flagged a gap in the analysis: the second identified blocker (physical nostalgia) was not adequately captured in the challenge formulation.

OPPORTUNITY

Global Virtual Presence. While physical travel becomes more bioregional and resource-constrained, digital connectivity, increasingly immersive, empathetic and accessible, can maintain deep ties across continents, preventing a total loss of global solidarity and cultural exchange. Validators suggested that sustainable mobility value chain thinking would strengthen

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this opportunity: examining what technologies are used in mobility systems, where they are built, with what materials, and under what socio-political conditions.

4.2.6 Procedural Justice

Transparent, inclusive decision-making in mobility governance, equitable policy implementation, and access to reliable information.

BLOCKERS

- **Black Box Governance:** Decision-making embedded within corporate AI or complex algorithms that the average citizen cannot understand, interrogate or challenge, rendering appeal mechanisms meaningless.
- **Consensus Paralysis:** Slow-moving deliberative processes that cannot respond quickly enough to climate crises or sudden technological shifts, creating governance inertia at precisely the moments when decisive action is required.

ENABLERS

- **Deep Consensus Models:** Ensuring mobility policies are weighted against long-term community well-being rather than short-term operational efficiency, building durable legitimacy through genuine deliberation.
- **Decentralised Sovereignty:** Allowing local communities to set their own transport protocols and 'rules of the game', creating a governance architecture that is simultaneously diverse and interoperable.

CHALLENGE

The Black Box Paradox. Shifting mobility governance to complex AI or algorithmic systems makes the decision-making process fundamentally opaque. If a citizen is denied mobility access by an algorithm, refused a subsidy, excluded from a routing optimisation, deprioritised in a congestion management system, they may find it practically impossible to understand why or how to appeal. This paradox is not merely technical: it is a structural democratic challenge. Validators endorsed the internal consistency of this challenge and its opportunity.

OPPORTUNITY

Decentralised Decision-Making. Digital ledger technologies, blockchain, distributed governance platforms, can shift mobility governance from top-down corporate boards to local communities, ensuring the 'rules of the game' are forged through genuine consensus rather than imposed by proprietary systems. Validators issued an important caveat: decentralised decision-making is not inherently just. It can be used by administrations to inappropriately shift accountability onto other actors, increase bureaucratic burden, or be exploited for populist purposes. Successful inclusion requires enabling institutional conditions, capacity building, adequate resources and clear accountability frameworks.

4.3 Conclusions from the Catalogue: Cross-cutting Themes and Interlinkages

The analysis of the catalogue entries across both sectors yields several important cross-cutting conclusions that transcend individual justice dimensions and have direct implications for the systemic policy design work of WP4.

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The validation workshop's Linkages Detection exercise surfaced several important horizontal connections between justice dimensions, within and across sectors. These cross-cutting themes transcend individual catalogue entries and have direct implications for the systemic policy design work of WP4.

The Reskilling Imperative

Across virtually all scenarios and both sectors, the challenge of reskilling emerges as a structural constant. The introduction of AI-driven farming systems, automated logistics, digital MaaS platforms and alternative protein production displaces significant numbers of workers, farmers, logistics operators, food processing workers, transport workers, while simultaneously creating demand for new technical and governance capacities. The challenge of reskilling is simultaneously a Distributive Justice issue (who bears the cost of transition and who captures the benefits), a Capacity Justice issue (who has access to reskilling resources), and a Procedural Justice issue (who has a voice in designing the reskilling systems). Any policy response that addresses reskilling in isolation from its justice dimensions will be structurally incomplete.

The Data Ownership Nexus

The question of who owns the data generated by precision agriculture, AI-managed logistics, MaaS platforms and mobility credit systems threads through Distributive Justice, Capacity Justice and Procedural Justice in both sectors. Data ownership is simultaneously an economic resource (revenue from data analytics), a governance tool (control over operational decision-making), and a democratic instrument (the basis for meaningful participation in algorithmic governance). Validators consistently flagged data ownership as the pivotal variable determining whether individual catalogue entries resolve as blockers or enablers. This points to the need for a dedicated data governance policy framework as a horizontal priority across both sectors.

Algorithmic Flattening and the Limits of Mathematical Equality

A recurring theme across Recognition Justice (both sectors), Capacity Justice (mobility) and Procedural Justice (both sectors) is the risk of algorithmic systems treating equality as mathematical uniformity rather than substantive equity. This 'algorithmic flattening' - the erasure of human difference, need and agency in pursuit of optimisation - is identified as both a design risk (systems built without justice intentions) and a governance risk (systems that acquire autonomy beyond their original design parameters). Validators noted that addressing this risk requires not merely technical design standards but fundamental shifts in power structures: who defines the parameters of algorithmic systems, and who has recourse when those systems produce unjust outcomes.

Centralised vs. Decentralised Governance: A Structural Tension

The catalogue consistently surfaces a structural tension between two legitimate governance imperatives: the need for continental-level coordination to ensure universal standards, equity baselines and anti-fragmentation protections; and the need for local-level autonomy to develop contextually appropriate solutions, preserve cultural diversity and ensure democratic legitimacy. This tension is not resolvable by choosing one pole over the other. The most resilient policy

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approaches are those that maintain a central body enforcing equity, interoperability and anti-monopoly standards while simultaneously empowering local and regional actors to implement solutions adapted to their contexts. This principle, articulated in D1.6's Conclusion as a 'Mandate for Hybrid Governance', is confirmed by the catalogue as the structural imperative for just twin transition policy design.

The Ecological-Social Interface in Agrifood

Validators in the Agrifood workshop noted a productive intersection between Ecological Integrity and Animal Justice and the dual imperatives of Capacity Justice and Recognition Justice: specifically, the combined opportunity of using small-scale farmers' local heritage knowledge as the foundation for regenerative agriculture, while simultaneously reskilling the broader agricultural workforce in the digital tools required to manage precision farming systems. This synthesis, regenerative agriculture as both an ecological and social strategy, represents one of the most concrete policy pathways emerging from the catalogue.

5 Vulnerable Groups

The tables below present the full cross-tabulation of vulnerable groups as identified through the 4CF HalnyX survey. They informed Sections 5.1–5.3 by revealing which groups appear structurally across all scenarios and which face scenario-specific risks.

The participatory foresight process underlying this catalogue identified and refined a set of vulnerable groups, those who face disproportionate risks of exclusion, harm or loss of agency across the four 2050 scenarios. These groups emerge from the structured justice lensing exercise on 4CF HalnyX. The full cross-tabulation by justice dimension, sector and scenario is presented in Tables 3 and 4. This section highlights the most analytically significant findings.

Table 3. Vulnerable Groups by Justice Dimension and Scenario: Mobility Sector

| Justice Dimension | Fragmented Efficiency | Managed Utopia | Mosaic of Resilience | Deliberative Commons |
|---------------------|--|--|---|----------------------------------|
| Distributive | Poor & disadvantaged; all groups middle class downwards | Privacy refusers; elderly (digital skills) | Groups not conforming to protocol rules; those unable to master digital tools; immigrants; disabled | Groups moving between regions |
| Recognition | Outsiders; people who are 'different' | Everyone (homogenised society) | Disabled; immigrants | Few vulnerable groups expected |
| Capacity | All – including wealthy in future generations; young males without education/structure | Elderly | People without digital access | Low vulnerability |
| Ecological | Animal lovers; those in ecologically deprived areas | – | Traditional & small-scale farmers; indigenous species | All – locked into climate change |

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| | | | | |
|---------------------|---|---------------------------------|---|-----------------------------------|
| Cosmopolitan | New generations; those who never learnt to leave their zone | Depending on global assumptions | Immigrants; future generations | Regions with poor starting points |
| Procedural | Persons outside communities; low-income; low-status | – | Those without political rights or active public participation | – |

Table 4. Vulnerable Groups by Justice Dimension and Scenario: Agrifood Sector

| Justice Dimension | Fragmented Efficiency | Managed Utopia | Mosaic of Resilience | Deliberative Commons |
|---------------------|-----------------------|-------------------|---|----------------------|
| Distributive | – | Everyone | Dissenters; those falling between cracks; youth expressing agency | – |
| Recognition | – | Everyone | – | – |
| Capacity | – | Elderly | Those whose interests are threatened when marginal voices become mainstream (conservatives) | – |
| Ecological | – | – | – | – |
| Cosmopolitan | – | Context-dependent | – | – |
| Procedural | – | – | – | – |

5.1 Universal and Cross-Scenario Vulnerability

Several vulnerable groups appear across multiple scenarios and both sectors, indicating structural vulnerability rather than scenario-specific risk. The most significant are:

- **The Digitally Excluded:** Across all scenarios, individuals and communities lacking reliable digital access, devices or skills face systemic exclusion from the benefits of both the green and digital transitions. This group is broadest and most severe in the Fragmented Efficiency scenario but persists, in different forms, across all four futures, including the Deliberative Commons where the slow pace of digital infrastructure rollout generates exclusion through inertia rather than neglect.
- **Workers and Communities Facing Displacement:** In both sectors, the automation of physical labour, farm work, logistics, food processing, driving, generates a structurally vulnerable population of workers whose skills are rendered obsolete faster than reskilling systems can respond. This group is particularly acute in Fragmented Efficiency and Mosaic of Resilience scenarios.
- **Rural and Peripheral Communities:** The spatial dimension of vulnerability is consistent across both sectors and all scenarios. Rural communities face compounding disadvantages: lower digital infrastructure, weaker access to sustainable mobility,

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greater exposure to environmental risks, and systematic underrepresentation in governance structures that are predominantly designed for and by urban populations.

5.2 Scenario-Specific Vulnerability Patterns

Beyond these universal vulnerabilities, the catalogue identifies distinctive vulnerability profiles associated with specific scenarios:

- Fragmented Efficiency generates the most diverse and severe vulnerability landscape, encompassing the 'Climate Poor' (those exposed to unmitigated environmental risk), the 'Truth and Knowledge Gap' population (excluded from elite digital information platforms), and all communities from the middle class downwards who lack access to the 'Green Zone' economy.
- The Managed Utopia scenario presents a distinctive vulnerability: those unwilling or unable to submit to pervasive data surveillance, including privacy-oriented individuals and those who reject the 'grand bargain' of autonomy for security. Validators noted that this scenario would likely eliminate the digital skills gap through universal system integration, making the primary vulnerability axis one of ideological and autonomy rather than technical access.
- The Mosaic of Resilience generates vulnerability at the boundaries of community protocols: those who do not conform to a community's specific charter - immigrants, those with disabilities requiring services the community cannot provide, and individuals who dissent from the community's dominant values - face exclusion based on adherence to local norms rather than historical categories of race or nationality.
- The Deliberative Commons presents the lowest overall vulnerability profile, but is not without risks: regions with poor economic starting points may remain poor despite the system's equity orientation, because the decentralised model offers no powerful redistributive mechanism to compensate for structural disadvantages. Groups moving between regions also face specific risks of falling between different local governance frameworks.

5.3 Newly Identified Vulnerable Groups

The participatory process identified several vulnerable groups not previously prominent in the READJUST inequality framework, including:

- The Conformity Marginalised: Highly individualistic or dissenting voices in consensus-heavy futures (particularly the Deliberative Commons), who face intense social pressure to conform within community-focused governance cultures.
- The Autonomy Deficient: In the Managed Utopia, a large population that enjoys material well-being but suffers from the systematic erosion of private space, independent choice and freedom of dissent, materially wealthy but politically and personally impoverished.
- The Protocol Excluded: In the Mosaic of Resilience, individuals or communities excluded from essential inter-community trade and governance networks due to non-adherence to shared technical or ethical protocols.
- Logistics Workers and Platform Economy Participants: Validators consistently noted that the catalogue's vulnerability mapping focused disproportionately on mobility users

rather than on workers and entrepreneurs in the mobility ecosystem, a gap that future iterations should address.

6 Conclusions and Implications

This catalogue was developed through a participatory three-phase process combining expert elicitation, analytical justice lensing and validation. It captures the collective knowledge of READJUST consortium members and invited experts as applied to four plausible 2050 futures. As with any foresight-based assessment, the findings are not predictions: they reflect the judgements of participants at a particular moment in the project, applied to scenarios that are themselves deliberate simplifications of complex futures. Notwithstanding these constraints, the conclusions drawn below are consistent across multiple justice dimensions, both sectors and the majority of the four scenarios.

This catalogue has mapped the landscape of challenges, opportunities, enablers and blockers facing a just twin transition in the Mobility and Agrifood sectors. The findings converge on several conclusions with direct implications for the policy development work of WP4.

The most consistent finding across all four scenarios, both sectors and all six justice dimensions is that the twin transition's technologies, precision agriculture, AI-managed logistics, electric vehicles, MaaS platforms, alternative proteins, VR telepresence, are justice-enabling only under specific governance conditions. Left to market dynamics, these same technologies generate and amplify inequalities: digital paywalls, data feudalism, algorithmic flattening and ecological apartheid. This finding reinforces the fundamental premise of the READJUST project and provides the empirical basis for asserting that strong, proactive policy design, not regulatory minimalism, is the precondition for a just transition.

Three challenges emerge as structurally universal, present across all scenarios and both sectors, and therefore demand policy responses that are architecturally robust rather than scenario-specific. These are: the reskilling imperative (the structural need to continuously rebuild worker and community capacities as automation displaces existing skills); the data governance deficit (the absence of adequate frameworks governing who owns, benefits from and has recourse against data generated in the twin transition); and the algorithmic transparency challenge (the systematic opacity of AI-driven governance systems). Policy options that do not directly address these three challenges will be structurally incomplete regardless of their technical merit.

The catalogue confirms the structural tension between continental coordination and local autonomy. The policy architecture that emerges from the evidence is one of hybrid governance: a central body enforcing equity baselines, interoperability standards and anti-monopoly protections, combined with strong local and regional mandates for contextually adapted implementation. Neither pure centralisation (the Managed Utopia risk) nor pure decentralisation (the Mosaic of Resilience risk) delivers justice. The Deliberative Commons scenario demonstrates that the most equitable futures are those designed for equity as a structural principle, not those that rely on the good intentions of market actors or the self-organisation of communities without adequate resources.

The catalogue directly populates the evidence base for T4.3 by identifying the specific policy intervention points where challenges can be transformed into opportunities. The highest-priority

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intervention areas, ranked by the frequency of their appearance across justice dimensions and both sectors, are: (1) universal access standards for green mobility and digital agrifood infrastructure; (2) data governance frameworks establishing public ownership or stringent regulation of agricultural and mobility AI; (3) transition-inclusive reskilling programmes co-designed with affected communities; (4) algorithmic transparency and accountability mechanisms enabling meaningful appeal; and (5) spatial equity investments targeting rural and peripheral communities.

The Challenges and Opportunities identified in the catalogue, combined with the Inequality Intensity Matrix, provide the analytical material for the READJUST Policy Action Roadmap. Specifically: the robustness of policy options against a governance vacuum and corporate capture; their resilience against technocratic overreach and autonomy erosion; their adaptability to radically decentralised governance contexts; and their viability under slow, consensus-driven decision-making with limited central enforcement capacity. From the future-proofing point of view, policy options that perform well across all four scenarios, the hallmark of genuine resilience, are those that address structural enablers (data governance, universal access, algorithmic transparency) rather than scenario-specific technological solutions.

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