



Assessing the low carbon transition at Grangemouth

A case study for measuring fairness

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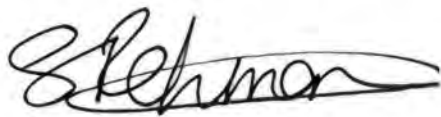
Co-Chairs Introduction

The Commission's remit requires we advise on the most suitable approaches to monitoring and evaluating the fairness of the transition to a low carbon economy. Our response to this complex question has been informed by the visits and conversations we have had around the country, learning directly from those impacted by the transition in how they perceive the fairness or otherwise of changes associated with the low carbon transition.

A consistent finding in our work is that while a national-level effort is key in setting a clear sense of direction, co-ordinating efforts and ensuring strategic alignment, it is at the local and regional scale that the social and economic effects of the transition are experienced most profoundly. This is recognised by the Scottish Government's commitment to developing just transition plans for regions as well as critical economic sectors with the full participation of principal stakeholders in these processes.

This report builds on the findings of the research we published in December 2024, applying the Scotland-wide framework for monitoring and evaluation (M&E) set out in that report to Grangemouth as a specific test case. This is, by intention, a particularly live example. As well as providing a toolkit for policymakers, in Scotland and beyond, for the application of an M&E framework for just transition at different scales, we hope it informs ongoing efforts to manage the crisis at Grangemouth and achieve a fairer transition.

Reflecting the “two-speed” approach to just transition policymaking that we have consistently identified, we are publishing this report so that its insights can be applied in the here and now, just as they help towards making just transition a credible and quantifiable process with clear lines of accountability for the medium-long term, including through the Scottish Government's renewed climate change planning process as carbon budgets come on stream.



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1. Introduction

This project took place between December 2024 and February 2025 and is deliverable to the Just Transition Commission. The aim of the project was to take the work produced in Phase One, the national Just Transition Theory of Change (ToC) for Scotland, applying this to Grangemouth and surrounding areas - a case that has been described as a litmus test for the Just Transition (Allan, 2023). Within this, further objectives were outlined, including:

- 1) To apply the ToC approach to the Grangemouth case to identify shortcomings (e.g., data availability, suitability at different scales, or the unsuitability for some places) (sections 6.4.1 - 6.4.8, sections 6.5.1 - 6.5.6, and section 7.1).
- 2) To identify what is practical and achievable now in terms of Just Transition monitoring and evaluation approaches for Grangemouth (section 6) and refine the ToC approach where required (reflections in section 6.6).
- 3) To compare and contrast with the monitoring and evaluation approach set out by Scottish Government in the Grangemouth Just Transition plan, flagging key areas for improvement/gaps between their planned approach (section 7.1) and the Phase One ToC recommendations, as well as ways to bridge these gaps (section 9).

We also provide a toolkit for how the national ToC was applied to Grangemouth. Our intention is that this will guide future applications to other Just Transition cases.

In Phase One, we positioned the Scottish National Just Transition ToC as something that could be scaled out, meaning that it could be replicated, adopted, or disseminated without substantial alteration. We also suggested it could be scaled up, referring to its transformation, evolution and development, typically through a combination of more complexity and a different application (Wigboldus and Leeuwis, 2013). This report reflects a combination of both approaches. The report's content has been formed iteratively and in response to various activities undertaken by the research team: rapid evidence review; stakeholder and responsibility mapping; systems mapping; ToC adaptation workshops; ethnographic fieldwork; and data matching.

This final report presents the work undertaken to achieve the aim and objectives. We begin with a statement on the application of the ToC across scales before a high-level summary of the Theory of Change model from Phase One and its various components, including the impacts, outcomes, and mechanisms. This is followed by an overview of the Grangemouth case, the translation of the ToC and

then comparison with the monitoring and evaluation approach set out by the Scottish Government. On the basis of the findings and discussion, this report provides recommendations for the Scottish Government to enable a JT ToC framework to be implemented successfully in place-based contexts. A test case illustrates what is practical (rather than perfect) right now whilst supporting short-medium term monitoring and evaluation of the Grangemouth Just Transition. The report is step-wise, introducing the key terms and approaches alongside the material, and is best read in its entirety. It is intended for the Just Transition Commission, who can use it to facilitate their scrutiny of the Scottish Government, as well as the Scottish Government and other staff working towards Just Transition action and accountability in Grangemouth.

Whilst detailed results and reflections are provided throughout the report, three key findings are summarised here:

- 1) Our application of the national ToC to the Grangemouth test case focused on a process of translation, where we interpreted the national ToC using localised perspectives and priorities. This required prioritisation of particular elements of the ToC and/or rewording to make them place-based and specific. The seven stage process for this forms a toolkit for future translations of the National ToC to different contexts.
- 2) The comparison between the national ToC and the Grangemouth Industrial Just Transition Plan illustrates that most attention is given to the “managed and principled innovation” mechanism. This reveals the limited reach of currently proposed actions for Grangemouth and may serve as a reference point for planning subsequent Just Transition interventions with a broader scope. Greater emphasis could be placed on identifying and safeguarding vulnerable and affected groups, for instance, as a core Just Transition concern.
- 3) The Grangemouth case study reveals three key lessons for both the application of the Just Transition ToC and the management of Scotland’s Just Transition more generally. We draw three examples: the importance of timeliness, of accountability and responsibility, and of place-based approaches.

We would note that this report provides an example of what a test case application might look like. It is *not* a final determination of what a Just Transition case study for Grangemouth *should* be. The results here follow the perspective of the researchers but the development of the Grangemouth monitoring and evaluation framework should be led by locally relevant stakeholders, including the ranking of the outcome cluster priorities.

2. Translating the framework

In Phase One, the national ToC brought disparate sectoral and regional plans together under a national umbrella to create a shared set of activities, outcomes areas and mechanisms for achieving a Just Transition. Applied to a more granular scale - the Grangemouth test case -, we argue that the translation of the national ToC can both represent local Just Transition concerns and, through this localised application, inform sectoral, regional and national plans and evaluations, so they can share common priorities and a common vocabulary. In this way, the local and national scales can work in dialogue, and regular reporting and feedback loops can help recalibrate strategies so the ToC is kept “live” in a range of applications. Figure 1 summarises this process.

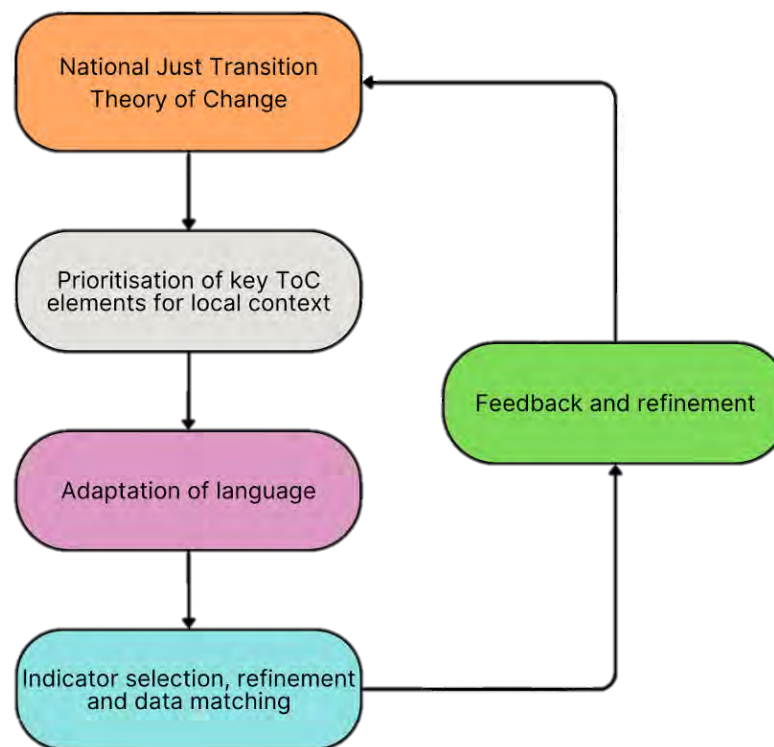


Figure 1: Translation process for applying the Scottish national Just Transition Theory of Change to localised contexts (Source: the authors)

Due to its complexity and scale, the Scottish Just Transition will reveal inevitable tensions and trade-offs where, for instance, progress in one area may create losses or offset progress in another. These tensions and trade-offs can happen across scales, arising from the complex interplay of local, national, and sometimes global priorities, often creating conflicts in the design and implementation of equitable policies (Anderson and Johnson, 2024). At the local level, communities and workers directly impacted

by the phase-out of fossil fuels may prioritise immediate job creation and economic security, while national governments focus on broader policy frameworks that align with, for instance, long-term decarbonization goals. So called ‘scalar misalignments’ risk fragmented strategies, where policies designed at one scale - whether local or national - fail to adequately address the concerns at another. This risk informs the approach taken in our report.

The risk of misalignment will increase when the language of the Just Transition differs across scales and where different monitoring and evaluation frameworks are used. For this reason, in translating the national Just Transition Theory of Change, we have focused on retaining common language, a refined but related aim, and translated outcomes and mechanisms (in recognition, in part, that the national ToC is cross-sectoral but, in a test case context, particular elements will carry more relevance). Rather than cherry picking aspects of the Just Transition national approach to fit the local context, all variables are considered. This prevents reducing a local Just Transition lens to a small subset of concerns without sight of the local contribution to the national picture or, indeed, a wider set of relevant local variables - for instance, a focus on jobs may lead to the neglect of wider social justice considerations. At the same time, the ranking of these national priorities at the local scale and the selection of local data will lead to a refined approach, allowing a case-based application intended to inform resolutions to local concerns.

3. The Phase One Theory of Change

Theory of Change is, on the one hand, a planning tool. It shows the intervention logic of a project – the steps that need to be taken to realise a desired goal or impact, and the expected results of these steps. But it goes beyond this intervention logic. Whereas logic models are essentially descriptive devices for mapping programme or project components and the relationships between them, the Theory of Change model has built into it a set of assumptions and hypotheses about what causes a problem, what particular actions will change that problem and what are the likely outcomes of these changes. In other words, a Theory of Change shows the theorised ‘causal pathways’ between a project’s objectives, its activities, and its expected outcomes and impacts. It says: “if we take action X, then this will cause effect Y and this will eventually lead to outcome Z”.

Theory of Change is, therefore, also a key *evaluation* tool. It tests the intervention logic of a project and allows this to be modified or refined through the evaluation process. The Theory of Change model specifies the underlying assumptions of a project and so incorporates a number of hypotheses about how the activities carried out as the project develops will *cause* changes at each stage of the project. The evaluation design and implementation approach follows this ‘change journey’. The evaluation data collected along the way enables these embedded ‘causal hypotheses’ to be tested. If the evaluation data do not support a particular hypothesis, then this hypothesis needs to be discarded or modified. Theory of Change is therefore a powerful tool to assess *attribution* – whether the project outcomes and impacts that can be identified through evaluation can be attributed to the actions carried out by the project.

Phase One of this project, the establishment of a Scottish national Just Transition Theory of Change, focused on consolidating what is known about how Scotland could achieve a Just Transition, and co-constructing a vision of what might work to ensure that the low carbon transition is fair and equitable. The project and its outputs were positioned as a foundation in establishing a common methodology to scrutinise, monitor and evaluate Just Transition-related activities across Scotland. The full ToC and the process for its development can be seen in our first report [Measuring and Evaluating the Scottish Just Transition](#). In Section 7, we compare the Phase One national ToC and the Scottish Government’s own measurement framework, with the Grangemouth, localised ToC developed in this document to clearly show the differences.

4. The Grangemouth test case

Grangemouth, located on the Firth of Forth, 40 km west of Edinburgh has a rich industrial history dating back to 1768. Originally founded as a port town to service the Forth and Clyde Canal, Grangemouth has gone through several phases of industrial expansion, from shipbuilding to ropemaking and petrochemicals. This makes Grangemouth a place of both industry *and* community. In the following sections, we introduce the Industrial Cluster, Grangemouth as a town, the stakeholder ecosystem in relation to both, and current proposals and plans in order to contextualise the later ToC application and analysis.

4.1 Grangemouth: The Industrial Cluster

The oil industry in Grangemouth gained a foothold as early as 1910 through the investment of the Anglo Persian Oil Company (later becoming British Petroleum), with a refinery opening on land near Grangemouth in 1924 under Scottish Oils Ltd. - a BP subsidiary. Related industries like chemicals and plastics, which use crude oil and its derivatives, developed around the initial investment, leading to the establishment of the so-called Grangemouth Industrial Cluster: one of the largest industrial hubs in the UK. In 2004, INEOS gained ownership of the main petrochemical plant, and in 2011, Petroineos (a joint venture of INEOS and PetroChina) took over. Since 2017, Petroineos' assets also include the Forties Pipeline System, which delivers almost 40% of the UK's North Sea oil and gas production (INEOS, 2021). Today, the Grangemouth Industrial Cluster (see Figure 2) is made up of a variety of organisations and functions including:

1. **Petrochemicals and refining:** Including INEOS Grangemouth, a major petrochemicals complex and the Grangemouth Refinery which processes crude oil into gasoline, diesel and other fuels and which supplies 65% of Scotland's refined oil product needs (Just Transition Commission, 2024a). The site is connected to the Forties Pipeline System bringing crude oil from the North Sea.
2. **Chemical manufacturing:** Including various chemicals used in plastics, coatings, and other industrial applications.
3. **Energy generation:** including gas-fired combined heat and power, energy-from-waste and ongoing hydrogen developments. Project Willow will consider the feasibility of transitioning Grangemouth to a low-carbon energy hub.

4. **Carbon capture and storage:** Grangemouth is planned to connect to the ACORN Transportation and Storage system, designed to store industrial CO₂ via decommissioned oil and gas infrastructure.
5. **Storage:** Grangemouth hosts Scotland's largest container port.

The Grangemouth refinery operations, supply chain and employee spending it induces had an estimated value of £403.6m in 2023, or around 0.19%* of the value added across the whole Scottish economy. It is also estimated to support 2,822 jobs across Scotland, of which 532 are its own direct employees (PWC, 2024).

Figure 3 shows that it is one of the highest emitting sites for greenhouse gas (GHG) in the UK.

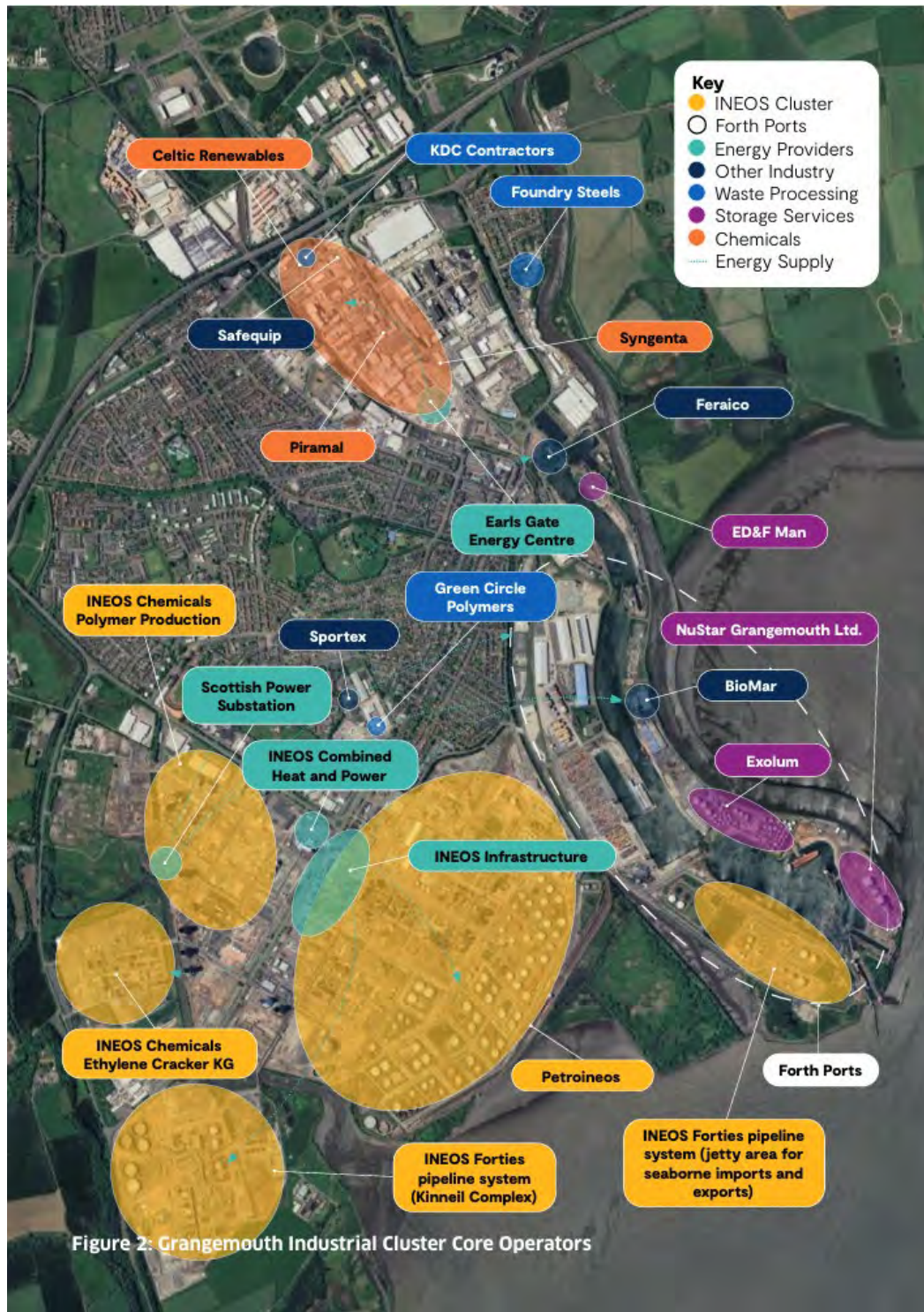


Figure 2: Grangemouth Industrial Cluster Core Operators (Source: Scottish Government, 2024)



Figure 3: Map of major UK industry cluster emissions in 2018 (Does not capture non-ETS emissions)
(Source: HM Government, 2021)

4.2 Grangemouth: The town and surrounding areas

The name “Grangemouth” is often loosely used to refer to the oil refinery and associated industrial operations - that is, the industrial component of the local area. Grangemouth is, however, a town and community in its own right. This is critical as whilst the industrial operations at Grangemouth present a particular Just Transition concern - primarily their imminent closure and the loss of associated jobs - Grangemouth as a town and community is subject to wider Just Transition concerns. Even prior to the planned closure of the facilities owned by INEOS and discussions around their repurposing, Grangemouth has experienced pervasive and complex inequality as a result of decades of deindustrialisation and disinvestment.

Recent research describes Grangemouth as “a dramatic example of noxious deindustrialization on a local level, where the phenomenon has put a strain on community–industry relations” (Feltrin, Mah and

Brown, 2022, p. 952). Noxious deindustrialisation means employment deindustrialisation where industries, such as the petrochemical industry, still operate. Since the golden era of “Boomtown Grangemouth” under BP in the 1950s, automation, slow growth, qualification barriers and outsourcing have led to a steep decline in the quantity and quality of industrial employment available to the local population (Feltrin, Mah and Brown, 2022) (see Table 1). Related changes such as the closure of the shipyard in 1983, the railway in 1968, and the consolidation of Grangemouth into Falkirk Council in 1975 have also impacted on employment and investment in Grangemouth (Scott, 2006). The shift from a wealthy community which benefited from high employment rates and social services provided by BP to one of the poorest in the country happened slowly but became apparent in the 2000s. Dramatic workforce layoffs, such as in 2002 when BP cut 700 workers (Lyon, 2017), and the gradual but notable decline in community benefits from the petrochemical industry, have contributed to unemployment and decreased the Grangemouth population.

Year	1951	1961	1971	1981	1991	2001	2011	2021
Population	15,432	18,857	24,569	21,599	18,517	17,906	17,373	16,240
		+3,425	+5,712	-2,970	-3,082	-611	-533	-1,133
		(+22%)	(+30%)	(-12%)	(-14%)	(-3%)	(-3%)	(-7%)

Table 1: Population in Grangemouth from 1951 to 2021, Census of Scotland 1951 to 202 (Source: Shibe, 2024)

Grangemouth now sits within the Falkirk council area. With a population of approximately 16,000, it hosts individuals both in the top and bottom segments of the Scottish Index of Multiple Deprivation (SIMD) covering the domains of income, employment, education, health, access to services, crime and housing (see Figure 4). This suggests a high degree of local economic inequality (PWC, 2024).

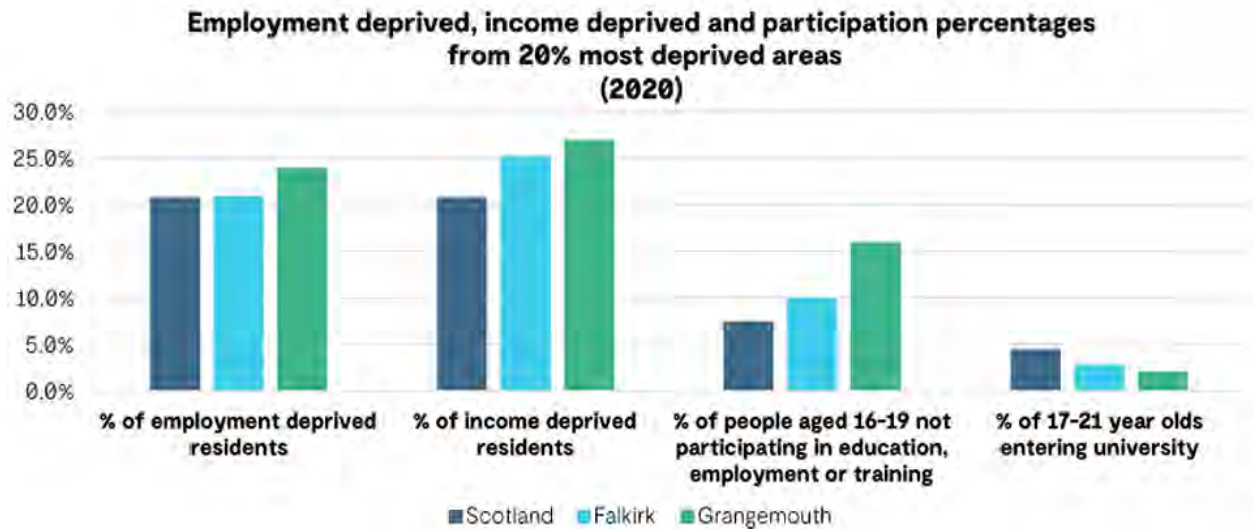


Figure 4: SIMD averages for employment-deprived, income-deprived and higher education results from 20% most deprived data zones of Scotland, Falkirk and Grangemouth (Source: Scottish Government 2024)

Several major labour disputes have occurred in the past 20 years, including Petroineos threatening to close a large part of its complex in 2013 unless workers accepted wage cuts (Lyon, 2017). This deterioration of labour relations and the poor environmental performance of the site have, arguably, contributed to the detachment of the community from the industrial site.

4.3 Stakeholder ecosystem

The Grangemouth area and Industrial Cluster host a large number of stakeholder groups and interests, each with varying interests and responsibilities. This includes large industrial operators and investors (including INEOs and Petroineos, the joint venture who operate the Grangemouth refinery); governments (with interests from the UK and Scottish level); local authorities (Falkirk Council); regulatory bodies (including the Scottish Environmental Protection Agency); trade unions (including, for instance, Unites’ “Keep Grangemouth Working” campaign); environmental groups and net-zero advocates and of course, the workforce and local community. The relative scale, resources and influence of stakeholder groups varies widely, as does their local embeddedness. In part as an outcome of ethnographic fieldwork (see section 5), Figure 5 shows a non-exhaustive stakeholder diagram according to eight broad stakeholder categories and an (illustrative, indicative) account of their supportive and obstructive role for the most influential stakeholders on Just Transition outcomes in and around Grangemouth.

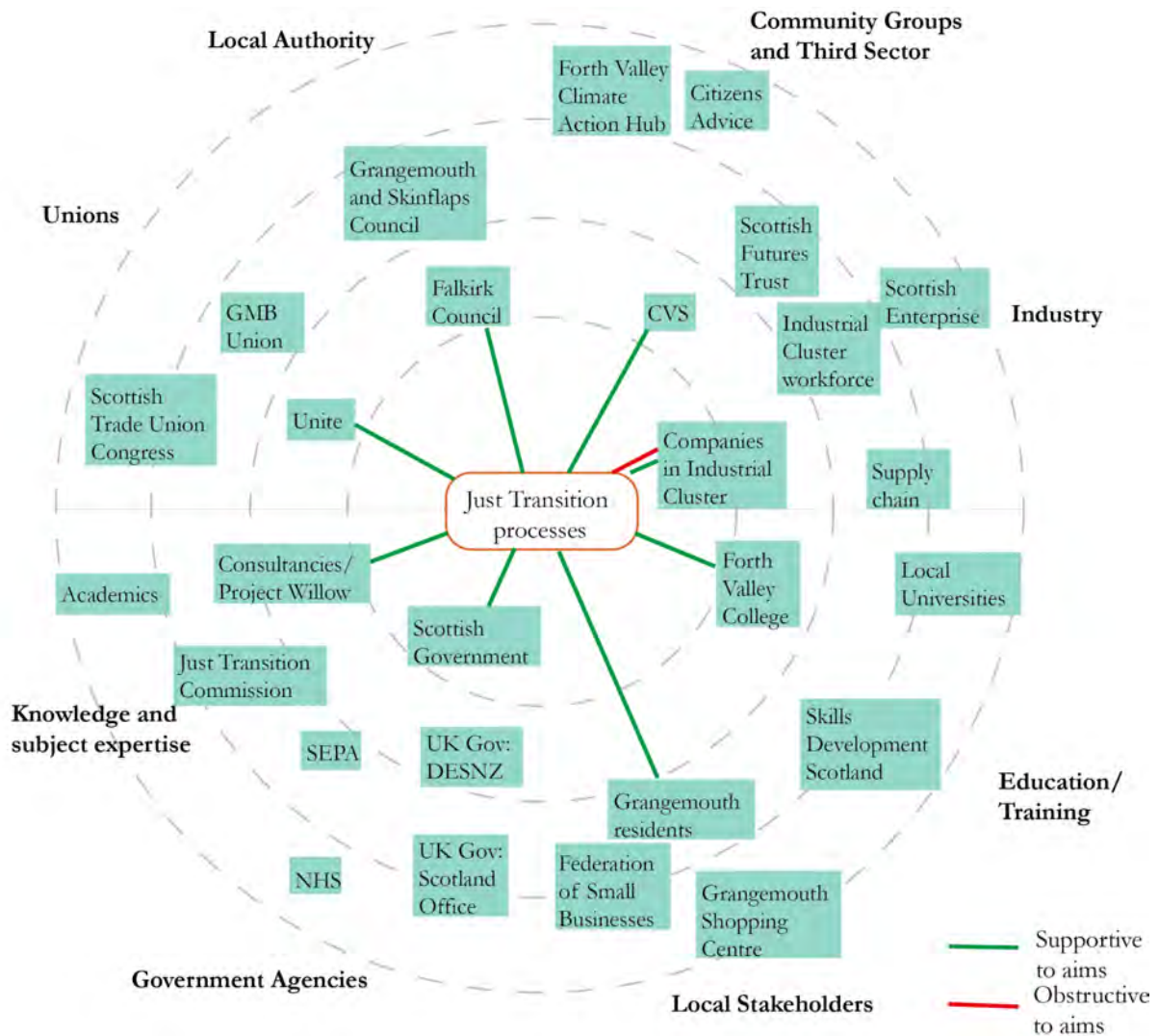


Figure 5: Stakeholder ecosystem diagram with scope and forms of influence. Proximity indicates how involved different stakeholders have been to planning and implementation processes for the Just Transition in Grangemouth (Source: the authors)

Ecosystems mapping is an established methodology in product and UX design and can be useful in identifying components of a design ecosystem. The ecosystem map is a synthetic representation which attempts to capture the key roles that have an influence on the user, organisation and service environment. The ecosystems maps also represent how close and intense the most involved stakeholder in each type is to Just Transition Process by proximity to the centre and how helpful different types of actors are:

1. There are a significant number of stakeholders with a great variety of interests and perspectives

2. There is a degree of consensus on the Just Transition in Grangemouth: almost all of the most influential stakeholders are supportive of Just Transition aims.
3. The most involved actors at the time this report was published are the Scottish Government and corporations in the Industrial Cluster. Corporations in the Industrial Cluster are both supportive of Just Transition aims (by their involvement in the planning and decision making bodies) and obstructive of these aims (by providing insufficient support to affected workers during the transition).
4. Whilst the industrial workforce have been consulted on Just Transition, local residents have been largely peripheral.

4.4 Transition plans and proposals

Grangemouth's Just Transition is a contested and rapidly-developing concern. The Grangemouth Industrial Cluster is undergoing significant changes, primarily due to the planned closure of its oil refinery by mid-2025, with some workers receiving redundancy letters on the week beginning the 5th of February 2025. This decision, announced by Petroineos in November 2023, is attributed to declining domestic demand for motor fuels and the broader transition to cleaner energy sources. The closure is expected to result in the loss of approximately 400 to 500 jobs (Just Transition Commission, 2024b).

In September 2024, both the UK and Scottish governments committed to a joint £100 million support package aimed at mitigating the economic impact and facilitating a sustainable industrial future for the region. This Falkirk and Grangemouth Growth Deal, signed in November 2024, outlines 11 projects designed to stimulate economic growth and create up to 1,600 jobs or £628m worth of economic benefits (UK Government, 2024). Key initiatives involve the development of a Carbon Dioxide Utilisation Centre, a Bioeconomy Accelerator Pilot Plant, and a Skills Transition Centre at Forth Valley College.

“Project Willow”, a joint UK and Scotland feasibility study, has explored opportunities to repurpose the refinery site for low-carbon industries, with the final report promised for the end of February 2025. The £1.5 million investment has identified three options for the Grangemouth industrial site, including low carbon hydrogen production, synthetic eFuels production and sustainable aviation fuel production. This includes consideration of the current skilled workforce and local expertise, as well as the long industrial heritage in the area. In the next phase, the options will be tested in terms of their feasibility to create long-term industries, with plans for engagements with the local community, trade unions, businesses, and industrial experts. On the 18th of February 2025, an additional £25 million of funding (labelled a “just transition” fund) was announced “to expedite any of the potential solutions that will be

set out in the Project Willow report, as well as other proposals that will give Grangemouth a secure and sustainable future” (Scottish Government, 2025). On the 23rd of February 2025, a further £200 million investment was announced from the National Wealth Fund “as part of a major intervention to ensure the long-term future of the industrial site”. This was accompanied by a “training guarantee” for Grangemouth refinery staff to ensure worker’s access to skills training at the local college is supported by UK Government funding (UK Government, 2025). The quick succession of large-scale funding investments increases the importance of implementing a suitable monitoring and evaluation approach that can identify their impacts and outcomes.

Despite these forward-looking plans, the refinery's closure has raised significant concerns among unions and local stakeholders about job losses and the broader economic implications for the community. Responding to the announcement of new funds, the union Unite demanded that the UK government “pull out all the stops” to support the refinery’s workforce and begin sustainable air fuel production (Unite, 2025). Over the preceding months, numerous community, union and worker groups have been established to represent local perspectives, including the Keep Grangemouth Working campaign.

5. Toolkit for applying the national ToC framework to local scales

Our application of the national ToC to the Grangemouth test case required a process of translation, where we interpreted the national ToC using localised perspectives and priorities¹. At times, this required prioritisation of particular elements of the ToC and/or rewording to make them place-based and specific. In this section, we present the step-wise toolkit used to undertake this work with the idea that this will guide future applications to other Just Transition cases. We provide both broad guidance and examples of how this work was undertaken in order to exemplify potential approaches to each stage. We do so as recognition that Just Transition monitoring and evaluation work is still embryonic and that without guidance, the ToC might be hard to translate.

The ToC translation process followed seven stages which can be replicated elsewhere. These stages are presented below as a toolkit for future translations of the National ToC to different contexts.

1. Define the scope of what you're looking at: the national ToC was designed as a cross-sectoral whole country ToC and will need adapting to the case in question, whether it is a region, sector, locality or even a different state (likely with different governance arrangements).

For this report: We responded to the scope set by the Just Transition commission.

2. Revisit the presenting problems: every context of application will vary according to key policies, social trends, economic and environmental considerations, and others. These variables will distinguish the local application from that considered in the Scottish national context, and therefore, be representative of case specific presenting problems.

For this report: To understand the presenting problem in for the Grangemouth test case, we undertook:

- A rapid evidence review.
- Historical analysis of Grangemouth's relationship with industry.
- Stakeholder ecosystem mapping.

¹ We note that for future case applications the aim is not necessarily to create a new ToC (the process for which can be complex and requires expertise), but to create a simplified, applied version through the translation process.

- A ToC adaptation workshop on the 11th of December 2024 attended by the report authors. This led to the prioritisation and redrafting of key outcomes and mechanisms, which were refined over a subsequent series of meetings.
- Fieldwork. A 2-day in-person trip to Grangemouth in January 2025 to conduct ethnographic fieldwork led to important place-based knowledge and observations, including through informal unstructured interviews and observations.

3. Revisit the long term aims: The long term aims reflect the desired final destination if the presenting problems were solved. Although there may be some areas of alignment with a national long term aim, case specific visions will also apply and must be reflected.

For this report: We first refined the ultimate aim as stated in the national ToC before checking if this statement was compatible with the resolution of the presenting problems identified in Step 2 above.

4. Prioritise and edit the outcomes: the outcome clusters reflect a broad array of potential focus points and cover a comprehensive number of Just Transition topics. Some will be more relevant to the application in question than others and so can be prioritised. Many may need editing to reflect relevant nuances. This step can be completed with reference to supporting documentation, including related monitoring and evaluation documents if available.

For this report: We initially ranked the outcome clusters based on Steps 1-3 above, prioritising those most fitting to the local context (lower priority outcomes can be seen in Appendix 5). These were then reworked to edit their phrasing and content, ensuring test case alignment. For this project, the outcomes were compared to the Grangemouth Industrial Just Transition Plan to achieve alignment where possible.

5. Refine the outcome indicators: national outcome indicators might not translate to different sectors or geographic scales. Data available at the national level may not be broken down at local or local authority level. Relevant local data may also be available.

For this report: We reviewed the existing national indicators attached to the outcomes selected to assess goodness of fit, irrelevance, omissions and data availability. Where available we matched data to the indicators.

6. Translating the mechanisms: How will you reach these outcomes? Refer to the complete list of actions and outcomes - which activities lead to your identified outcomes? What mechanism are they a part of? Are the process indicators fit for your needs?

For this report: We prioritised the mechanisms in terms of the most important actions that need to be undertaken to reach the priority outcomes in Grangemouth. Where necessary, the wording of the mechanisms was altered to align with the local context and Scottish Government planning.

7. Refine the mechanism indicators: as with stage 5, national indicators for the mechanisms might not translate to different sectors or geographic scales.

For this report: We reviewed the existing national indicators attached to the mechanisms selected to assess goodness of fit, irrelevance, omissions and data availability.

In section 6, we present the findings of these steps as applied to the Grangemouth test case.

6. Findings

In this section, we apply the national ToC to the Grangemouth test case to identify where shortcomings may be (e.g. data availability, suitability at different scales, or unsuitability for some places). Figure 6 shows the original national ToC, which outlines the presenting problem that the Just Transition in Scotland is meant to address, the mechanisms (which as the levers that must be pulled to achieve long-term impacts), the outcome clusters which are desired to be achieved, and the long-term impacts to be achieved by 2045 that would signify that a Just Transition. This ToC was accompanied by detailed work on causal chains and indicator/data sources. Through the process of translating the ToC, the presenting problem and ultimate aim was updated, and outcomes and mechanisms were prioritised and refined. Figure 7 shows the Grangemouth test case application in summary.

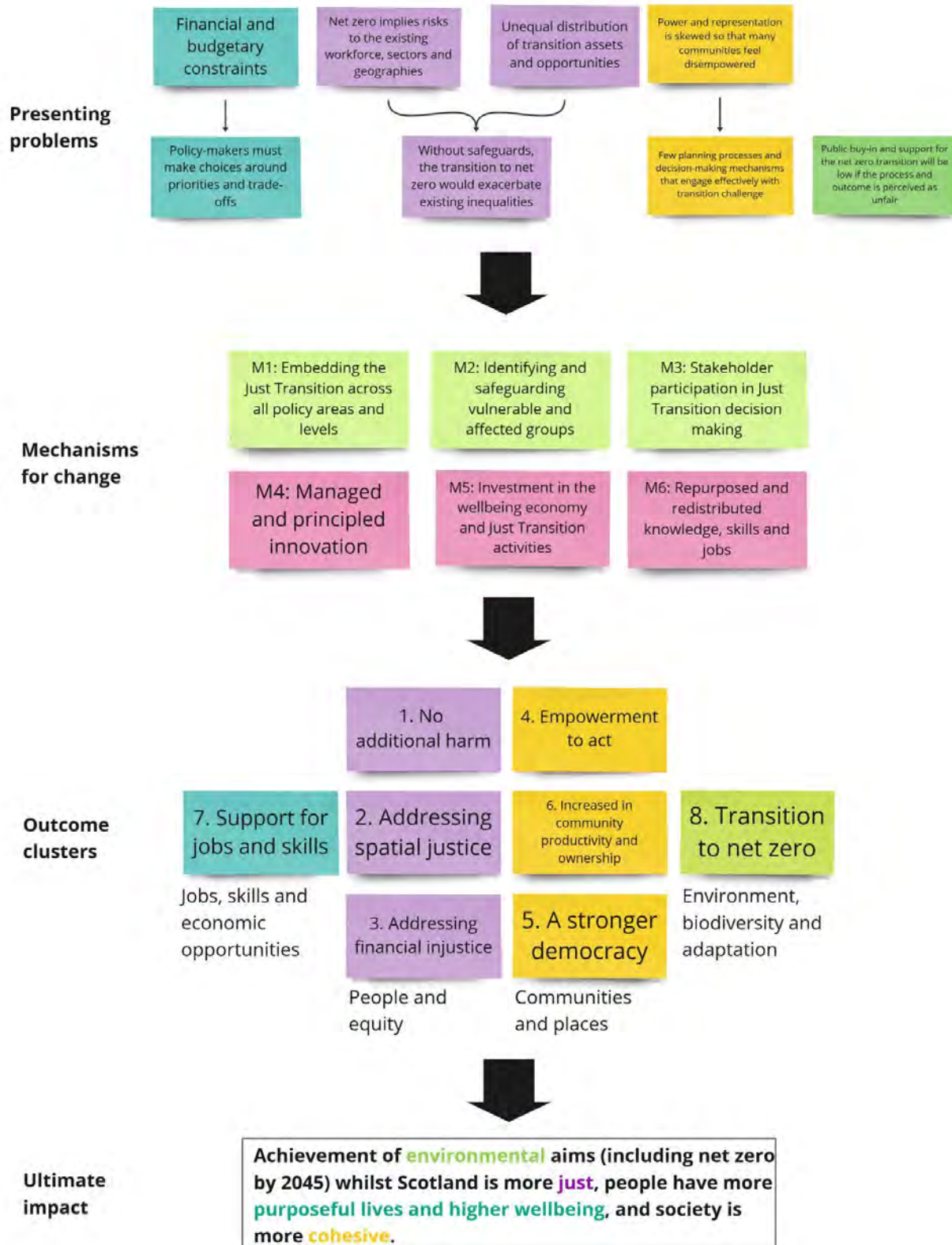


Figure 6: The Scottish Just Transition Theory of Change (Source: the authors)



Figure 7: The Grangemouth Test Case Theory of Change Application (Source: the authors)

6.1 Presenting problem summary

In the Phase One ToC for Scotland, several presenting problems were identified, as shown in Figure 6. These presenting problems represent the challenges that the Scottish Just Transition should solve. Setting them out allows the mapping of a “change journey” so that you can see the connections between the “presenting problem” the project wants to solve, the expected impact on that problem at the end of the project and everything that’s supposed to happen in between. These initial problems include that there is currently an unequal distribution of transition assets and opportunities, and, without safeguards, the transition to net zero will exacerbate existing inequalities (as well as potentially creating new ones). Below, we present the presenting problems adapted for the Grangemouth Test Case, where points 2, 4 and 7 have been edited and 9 - 11 are new additions.

1. Unequal distribution of transition assets and opportunities
2. Power and representation is skewed so that many community **members** feel disempowered, **including widespread inequalities across the Falkirk council area**
3. Financial and budgetary constraints
4. Net zero implies risks to the workforce **in the Grangemouth Industrial Cluster**
5. Policy-makers must make choices around priorities and trade-offs
6. Without safeguards, the transition to net zero would exacerbate existing inequalities
7. Few **timely** planning processes and decision-making mechanisms engage effectively with transition challenges
8. Public buy-in and support for the net zero transition will be low if the process and outcome is perceived as unfair
9. **Historical patterns of deindustrialisation are not appropriately recognised, where job concerns overshadow issues of wider inequality**
10. **The industrial sector presence means the Just Transition actions have focused on industry to the exception of other areas e.g. transport, fuel poverty**
11. **Grangemouth's transition from high-carbon industry has been delayed with little coordinated action, leading to risk of hundreds of redundancies and no succession plan for the industrial sector**

6.2 Ultimate aim

The ultimate aim (or ‘ultimate impact’) is a statement of aspiration or intent - a goal for what can be achieved at the end of a project. In Phase One, the national ultimate aim represented a statement of how

Scotland would benefit from achieving its Just Transition ambitions in 2045. As a more fair, equitable and environmentally positive country, the 20 year impact was encapsulated in this statement:

Scotland: Achievement of environmental aims (including net zero and nature positive by 2045) whilst Scotland is more just, people have more purposeful lives and higher wellbeing, and society is more cohesive.

For the Grangemouth test case, this was adapted to read:

Grangemouth: Grangemouth's decarbonisation is just in process and outcome, and higher wellbeing is enabled by effective governance, local investment, and high value employment. Society is more cohesive whilst Grangemouth achieves environmental aims including net zero and improved air quality by 2045.

This reflects that the primary concern in Grangemouth's Just Transition is around the fairness of the process and outcomes of decarbonisation, particularly concerns with good employment, local investment and governance. Environmentally, air quality is a greater concern in Grangemouth due to industry emissions.

6.3 Grangemouth Just Transition outcomes

Arguably, the key element for monitoring and measuring the success of a long-term, ongoing programme from a Theory of Change is the outcomes. Here, outcomes refer to the short- to medium-term results of actions. An outcome is a state or condition that does not currently exist but must exist for an initiative to work.

In order to identify a list of representative Just Transition outcomes relevant to Grangemouth, we first ranked those used in the national ToC in order of key priorities for the local context as it stands now (see Figure 8), then edited the descriptions of the key outcomes - those that sit under the broad outcome cluster title (e.g., "addressing spatial justice") to serve as a proxy outcome for the whole cluster (see Table 2).

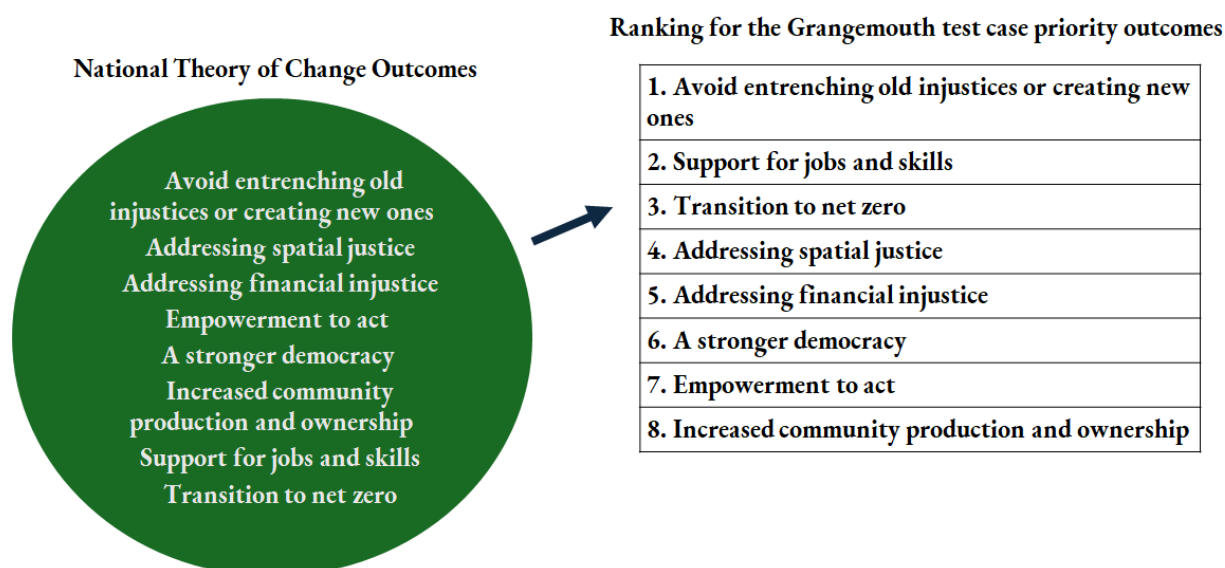


Figure 8: Comparison of the Scottish National Just Transition Theory of Change outcomes with an initial ranking of the Grangemouth test case (Source: the authors)

Key outcomes for National ToC	Key outcomes for Grangemouth test case (changes in bold)
Avoid entrenching old injustices or creating new ones: Presenting inequalities aren't reinforced or extended	1. Avoid entrenching old injustices or creating new ones: Presenting inequalities aren't reinforced or extended
Support for jobs and skills: a) Retention and creation of access to green, fair and high-value work with a more open and fairer job market b) Equip people with the education and training required to develop skills and gain access to fair jobs	2. Support for jobs and skills: a) Retention and creation of access to fair and high-value work with a more open and fairer job market b) Equip people with the education and training required to develop skills and gain access to fair jobs
Transition to net zero: Reduction of Scotland's GHG emissions and increases to biodiversity	3. Transition to net zero: Reduction of Grangemouth's GHG emissions and improvement in air quality
Addressing spatial justice: Reduced local and regional spatial inequality in Scotland	4. Addressing spatial justice: Increased equality in Grangemouth locally with reference to multiple indicators of deprivation across Scotland
Addressing financial injustice: Reduced economic inequality in Scotland	5. Addressing financial injustice: Reduced economic inequality in Grangemouth

A stronger democracy: Increased trust in local institutions and decision making	6. A stronger democracy: Increased trust in local institutions and decision making and increased accountability and responsibility for key stakeholders
Empowerment to act: increased sense of agency	7. Empowerment to act: Increased sense of agency and hope
Increased community production and ownership: Communities maximise their local production and ownership	8. Increased community production and ownership: Communities maximise their local production and ownership

Table 2: Comparison of the Scottish National Just Transition key outcomes and reworded key outcomes for the Grangemouth test case (Source: the authors)

In addition to ranking the outcome clusters and editing the key outcomes, indicators were revisited and revised, selecting those most appropriate to the Grangemouth test case. Sections 6.3.1 - 6.3.8 present the outputs.

6.4 Summary of Grangemouth Just Transition outcomes indicators

We selected the outcome indicators in three stages. First, following the prioritisation of outcomes clusters, a set of ‘ideal’ sub-outcomes and measures were selected for each outcome category. Second, these outcomes and measures were aligned with the existing national indicators from the first phase of the Just Transition ToC and the Grangemouth Industrial Just Transition Plan (GIJTP), with additions made to ensure that the sub-outcomes covered all necessary aspects of the Just Transition results desired in Grangemouth. Finally, a series of adjustments were made to ensure the number of measures was manageable and that measures would fit existing data where possible. This process led to 28 outcome indicators being selected, of which only six had no data currently available.

Since, where possible, we used measures from the national ToC and the Scottish Government’s GIJTP, the three sources of measures were not equally represented: 13 measures were adapted from the national ToC, 11 measures from the GIJTP and six bespoke local measures which were not covered elsewhere. The full list of outcome measures is presented in Appendix 2.

As with the national ToC, we also developed a dashboard which shows the progress made for Just Transition measures for Grangemouth for indicators where two or more data points exist.

Deteriorating (6)	Maintaining (3)	Improving (10)
1.3 Sense of pride and hope in Grangemouth	1.1 No deterioration in any of the 25 sub-areas of Grangemouth according to the Scottish Index of Multiple Deprivation	1.2 Average salaries in Grangemouth
2.1.1 Rate of people of working age in Grangemouth not in employment, education or training for affected areas	5.3 Prevalence of child poverty in Grangemouth	2.1.2 Participation in adult learning in Grangemouth
2.2.5 High-skilled occupations as a proportion of the workforce in Grangemouth	8.2 Number of assets in community ownership in Grangemouth	2.2.1 Total jobs earning over real Scottish Living Wage in Grangemouth
3.1 Annual GHG emissions in Grangemouth		2.2.4 Unemployment in Grangemouth
3.2 Average Air Quality Index (AQI) score in Grangemouth		4.1 Leveling up of most deprived 25 sub-areas of Grangemouth according to the Scottish Index of Multiple Deprivation
4.2 Development of clean, safe, green, and accessible public and private spaces in Grangemouth		5.1 Percentage of households reporting financial difficulties in Grangemouth
		5.2 Prevalence of fuel poverty in Grangemouth
		6.3 People in Grangemouth feel able to influence decisions affecting their local area
		7.1 People in Grangemouth are empowered to take action
		7.2 People in Grangemouth would like to be involved in decision making

The dashboard shows improvements in six of the eight outcome clusters, and most are within the top four priority outcomes. However, the major transitional ‘pinch point’ has not yet occurred with major

deindustrialisation planned for 2025 including redundancies. Data in the forthcoming year is likely to show significant deterioration if Just Transition processes are not effective. It is also worth noting that all six indicators which are deteriorating are in the top four priority outcomes. It is also worth noting that in the majority of cases, data for the measures is for the Falkirk Local Authority area, and so the data is less sensitive to changes in Grangemouth in particular; in the context presented in section 4 of Falkirk's affluence relative to Grangemouth, this is an important area for improvement for future monitoring data collection. The indicators selected are explored in the section below.

6.4.1 Avoid entrenching old injustices or creating new ones

The Just Transition comes with opportunities and risks. Whilst many individuals, communities, and groups will be affected by Net Zero and Just Transition processes as they integrate new technologies or see changes to their income streams, some socio-demographic groups will be comparatively more affected (Jenkins et al., 2016). As in Phase One, this cluster refers to the potential to unintentionally reinforce or extend previous injustices throughout transitions, and to create new ones. The key outcome is that presenting inequalities aren't reinforced or extended.

Measure	Origin	Currently available data	Data source	Latest data	Progress
1.1 No deterioration in any of the 25 sub-areas of Grangemouth according to the Scottish Index of Multiple Deprivation	Bespoke	Number of sub-areas of Grangemouth moving into one of the bottom deciles (20% or 10%) of most deprived areas in Scotland according to the SIMD	Link	0 (2020)	Maintaining
1.2 Average salaries in Grangemouth	Adapted from GIJTP	Average salaries for Grangemouth residents (Gross Weekly Pay - All Full Time Workers in Falkirk) are maintained or improve	Link	£724.60 (2024)	Improving
1.3 Sense of pride and hope in Grangemouth	Adapted from GIJTP	Proportion of people in Falkirk who rate their neighbourhood as a good/very good place to live	Link	92% (2023)	Deteriorating

Grangemouth, as one of the most disadvantaged localities in Scotland, has a particular vulnerability to changes in local employment and the distribution of wealth. There are 5 areas within the most 20% deprived Scottish Index of Multiple Deprivation in the latest data (including the Town Centre, Kersiebank, and Bowhouse) (Just Transition Commission, 2024a). We argue that ensuring that the standard of living is not impacted further is the main priority now, given the imminent closure of several industrial sites in Grangemouth.

6.4.2 Support for jobs and skills

One of the key outcomes for the Just Transition is to ensure that carbon-intensive jobs are replaced in the low-carbon economy in a fair way. This also concerns ensuring that new jobs are good jobs, following Fair Work First principles, and that restorative justice is practiced so that those harmed in the transition have new job opportunities. Skills at risk of being lost in the transition, such as for professionals such as gamekeepers should be safeguarded (Just Transition Commission, 2023). The key outcomes are: (a) equip people with the education and training required to develop skills and gain access to fair jobs and (b) retention or creation of access to green, fair and high-value work with a more open and fairer job market.

Equip people with the education and training required to develop skills and gain access to fair jobs.

Measure	Origin	Currently available data	Data source	Latest data	Progress
2.1.1 Rate of people of working age in Grangemouth not in employment, education or training for affected areas	National ToC	Percentage of adults (16-65 year olds) who are economically inactive in Falkirk (Annual population survey)	Link	25% (2024)	Deteriorating
2.1.2 Participation in adult learning in Grangemouth	National ToC	Number of people aged 16-64 who have received job related training in the last 13 weeks. Adult Participation in Learning Survey Falkirk	Link	21,200 (2024)	Improving
2.1.3 Total number of workers from	Bespoke	No data for the Grangemouth Industrial Cluster	Data not collected	N/A	N/A

Grangemouth Industrial Cluster who completed a training course in the past year					
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Without investment in and timely action towards education and training, workers may be left behind as they are under-supported and unable to transition to new work within the same or different sectors. This risks both the loss of skilled workforces and deepening of inequalities for vulnerable and affected groups, particularly with those who are economically precarious. In Grangemouth, with closures and restructurings imminent and replacement industries still in the feasibility and development stage (e.g., the options shortlisted by Project Willow), education and training requires significant investment.

Retention or creation of access to green, fair and high-value work with a more open and fairer job market.

Measure	Origin	Currently available data	Data source	Latest data	Progress
2.2.1 Total jobs earning over real Scottish Living Wage in Grangemouth	Adapted from GIJTP	Average hourly pay for bottom 10 percent of workers in Falkirk	Link	£12.35 (2024)	Improving
2.2.2 Ratio of jobs created to jobs lost in Grangemouth	Bespoke	No data, should measure balance of jobs created and jobs lost in Grangemouth Industrial Cluster	Data not collected	N/A	N/A
2.2.3 Job satisfaction for those working in Grangemouth Industrial Cluster	National ToC	No survey collected yet, should be composite of satisfaction with pay and benefits, employment contracts, work-life balance, job design and the nature of work, relationships at work, employee voice, and health and wellbeing	Data not collected	N/A	N/A

2.2.4 Unemployment in Grangemouth	Adapted from GIJTP	Number of people modelled to be unemployed in Falkirk by the ONS	Link	2800 (2024)	Improving
2.2.5 High-skilled occupations² as a proportion of the workforce	National ToC	Proportion of people working in high-skilled occupations (data for levels 1-3) in the workforce in Falkirk East	Link	38% (2024)	Deteriorating

The closure or restructuring of components of the Grangemouth Industrial Cluster will affect the availability of jobs and the skills required to perform them. The closure of the Petroineos oil refinery brings the loss of between 400 and 500 jobs (Just Transition Commission, 2024b). Recognising the immediacy and centrality of concerns related to these job losses, measures relating to the retention or creation of access to green, fair and high-value work with a more open and fairer job market are crucial.

6.4.3 Transition to net zero

The Just Transition cannot be complete until the low-carbon transition is also complete. The primary goal of the low-carbon transition is to reduce the impact of humans on the environment and this is also the operating context for the Just Transition - doing so in as fair a way as possible. We also expected that when the transition is fair, net zero progress will increase: demand reduction and engagement are key to reaching net zero goals and these are facilitated through Just Transition. Without a Just Transition, public opinion towards climate change mitigation is likely to be far less favourable and resistance will slow down the low-carbon transition. The key outcomes here are the reduction of Grangemouth's GHG emissions and improvement in air quality.

Measure	Origin	Currently available data	Data source	Latest data	Progress
3.1 Annual GHG emissions in Grangemouth	Adapted from GIJTP	GHG emissions from Grangemouth Industrial Cluster in MtCO ₂ e (Scotland data for 1A1b_Petroleum_Refining and	Link	3.48 (2022)	Deteriorating

² High-skilled occupations are classified in the SOC2010 categories 1,2,3.

		2B8g_Petrochemical_and_carbon_black_production:Other)			
3.2 Increase in average Air Quality Index (AQI) score in Grangemouth	Adapted from GIJTP	Total annual air quality exceedances in Grangemouth (six monitoring locations) for SO ₂ , NO ₂ , PM ₁₀ and PM _{2.5} (for shortest recorded time periods possible) [LAQM monitoring]	Link	40 (2023)	Deteriorating
3.3 Biodiversity in Grangemouth (terrestrial abundance of priority species)	National ToC	No data (priority species identified in 'Second Nature: A Biodiversity Action Plan for the Falkirk Council area')	Link	N/A	N/A

The Grangemouth Industrial Cluster is one of the largest sources of emissions in Scotland and its decarbonisation could make a substantial contribution to Scotland's climate change ambitions. At the same time, there are concerns for the exposure of residents and workers in Grangemouth, including the oldest, youngest and those with pre-existing medical conditions, to poor air quality. We argue that given the immediacy of climate (and air quality) concerns and given that in Scotland, interim climate targets have been missed and subsequently removed (Jenkins, 2024), the statement “the Just Transition cannot be complete until the low-carbon transition is also complete” is particularly pertinent in for the Grangemouth case.

6.4.4 Addressing spatial injustice

A spatial justice approach involves not only revealing and describing geographical inequalities, but also critically evaluating such inequalities in terms of wider forms of (in)justice and their effect on human well-being (Bouzarovski and Simcock, 2017). Spatial justice is also closely related to adaptation to the local effects of climate events such as flooding, which can disproportionately affect vulnerable neighbourhoods. The key outcome is increased equality in Grangemouth locally with reference to multiple indicators of deprivation across Scotland.

Measure	Origin	Currently available data	Data source	Latest data	Progress
4.1 Levelling up of most deprived 25 sub-areas of Grangemouth according to the Scottish Index of Multiple Deprivation	Bespoke	Proportion of sub-areas of Grangemouth in the bottom two deciles (bottom 20%) for multiple deprivation for the SIMD index	Link	20% (2020)	Improving
4.2 Development of clean, safe, green, and accessible public and private spaces in Grangemouth	Adapted from GIJTP and National ToC	Access to green/blue space in Grangemouth - % of people in Falkirk who live within 5 minute walk of nearest green/blue space	Link	75% (2023)	Deteriorating
4.3 Reduced geographical differences in transport poverty in Grangemouth	National ToC	Percent dissatisfied with the cost of bus fares in Grangemouth (Grangemouth Transport Study)	Link	58% (2024)	N/A

Spatial inequalities are clear across Grangemouth and the surrounding area, including access to services and housing (as part of the Scottish Index of Multiple Deprivation), and exposure to polluting industry. Access to public transport is poor, presenting barriers to labour markets and job opportunities, education providers and access to the wider central belt, thereby increasing private transport dependence (Scottish Government, 2024). Avoiding entrenching or creating new spatial injustices will be critical in the Just Transition for Grangemouth.

6.4.5 Addressing financial injustice

Action to enable a Just Transition recognises a range of forms of injustice, including financial or economic (Martiskainen et al., 2021). Income, wealth and financial injustice are seen to be highly related in capitalist society, where wellbeing is often determined by purchasing power (Abram et al., 2022). Financial injustice is also closely related to spatial differentiation and other socio-demographic intersectionalities, including those due to class and gender. The key outcome is increased addressing financial injustice: reduced economic inequality in Grangemouth.

Measure	Origin	Currently available data	Data source	Latest data	Progress
5.1 Percentage of households reporting financial difficulties in Grangemouth	Adapted from GIJTP	Scottish Household Survey: % of households in Falkirk who answer "does not manage well" to the question "How the household is managing financially"	Link	7% (2023)	Improving
5.2 Prevalence of fuel poverty in Grangemouth	Adapted from GIJTP and National ToC	Number of dwellings in fuel poverty estimated by analyses from the Scottish House Condition survey for Falkirk	Link	13,000 (2019)	Improving
5.3 Prevalence of child poverty in Grangemouth	National ToC	Falkirk child poverty rates (after Housing Costs by Local Authority)	Link	26.2% (2023)	Maintaining

Grangemouth and the surrounding area are exposed to several forms of financial injustice. The Falkirk North and Grangemouth wards have the highest proportion of children living in households experiencing relative poverty compared to the rest of the Falkirk area (NHS Forth Valley, 2023) and the Grangemouth areas of Avonbank Avenue, Kingseat/Craigleith, and Torwood Avenue have been identified as having high concentrations of individuals living in poverty. People in these areas suffer from multiple issues of disadvantage and deprivation (Falkirk Council, 2011).

6.4.6 A stronger democracy

Democratic outcomes have been incorporated as a goal within a Just Transition in recent years, as the outcomes of greater democratic engagement, particularly at a local level, lead to fairer outcomes for locals. Raising the voices of vulnerable people in policy decisions helps to achieve Just Transition ambitions, lower anger and resentment with the low-carbon transition and improves policy outcomes (Osicka et al., 2023). The key outcome is increased trust in local institutions and decision making and increased accountability and responsibility for key stakeholders.

Measure	Origin	Currently available data	Data source	Latest data	Progress
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6.1 Effectiveness of GFIB (or its successor) as a forum for community to voice concerns regarding industrial transformation	Adapted from GIJTP	Survey not yet collected	Data not collected	N/A	N/A
6.2 CSR investment from corporations based in Grangemouth Industrial Cluster	Bespoke	Calculation of annual CSR funds spent in Grangemouth	Data not collected	N/A	N/A
6.3 People in Grangemouth feel able to influence decisions affecting their local area	National ToC	Percentage of people in Falkirk who respond 'Strongly agree' or 'tend to agree' to 'Can you influence local decisions?'	Link	16% (2022)	Improving

Grangemouth sits under Falkirk Council, which oversees local governance and decision-making. Residents can participate in the democratic process through local elections, community councils, and public consultations (and more) on issues affecting the town, including through the Grangemouth (including Skinflats) Community Council. However, challenges such as industrial influence, economic shifts, and national policy decisions can impact the extent of local decision-making power.

6.4.7 Empowerment to act

The Just Transition should be co-designed and co-delivered to empower all partners. Empowerment in the Just Transition is both a process and an outcome (Scottish Government, 2021). Empowerment should ensure that actions taken are fair and co-ordinated, communities are invigorated and local economies are stronger (Just Transition Commission, 2021). The key outcome is an increased sense of agency and hope.

Measure	Origin	Currently available data	Data source	Latest data	Progress
7.1 People in Grangemouth are empowered to take action	Adapted from GIJTP	Percentage of Grangemouth residents agreeing with the statement 'This is a neighbourhood where local people take action to help improve the neighbourhood'	Link	61% (2023)	Improving

7.2 People in Grangemouth would like to be involved in decision making	National ToC	Percentage of people who "would like to be more involved in the decisions my council makes that affect my local area"	Link	37% (2022)	Improving
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Empowerment to act in Grangemouth comes through community involvement, local representation, and initiatives that give residents a voice in shaping outcomes. Groups including the Forth Valley Action Hub work to ensure that interested residents can climate action at a community level. As with the attainment of a stronger democracy, empowerment challenges remain around balancing community needs with the interests of large industries and national policies. Strengthening local democracy and access to resources can further empower people to take meaningful action.

6.4.8 Increased community production and ownership

The language of community ownership is central to a Just Transition. Community ownership is positioned as driving investment in the local area, creating revenue streams that communities can direct towards local infrastructure and services (Friends of the Earth, 2024). This comes in contrast to commercial ownership that drives company profits. Community and local ownership enables communities to take a leadership role, where costs are minimised and people and places benefit. The key outcome is increased community production and ownership where communities maximise their local production and ownership.

Measure	Origin	Currently available data	Data source	Latest data	Progress
8.1 Number of community or locally owned renewable energy installations/ operational renewable energy capacity in community and local ownership (in absolute numbers and MW) in Grangemouth	National ToC	Number of community or locally owned renewable energy installations/ operational renewable energy capacity in community and local ownership (in MW)	Link	330 (2023)	N/A

8.2 Number of assets in community ownership (any land, buildings and any other property of substantial value that a community group may own) in Grangemouth	National ToC	Number of assets in community ownership (building only/land and building)	Link	0 ³	Maintaining
8.3 Local determination of use of unused and decommissioned sites in Grangemouth	Bespoke	Yearly consultations run on unused and decommissioned sites	Data not collected	N/A	N/A

The Grangemouth community can engage with the ownership of a range of community assets, including energy production and other community infrastructure. This includes greenspace or community leisure assets such as the golf club and Grangemouth Stadium, both of which have transferred to community-led organisations. However, community ownership of any element of the Industrial Cluster - as such a large, dominant piece of infrastructure around Grangemouth - is very unlikely, therefore influencing our ranking of this outcome cluster.

6.5 Grangemouth Just Transition mechanisms

As part of the Theory of Change mapping, we have elaborated the mechanisms that may produce the high-level outcomes. Our emphasis on mechanisms is partly in recognition that the Just Transition is driven as much in terms of how outcomes are achieved (through joined up policy making, identification, safeguarding, and stakeholder participation) as it is concerning a fairer economy and society. Mechanisms are a useful conceptual tool to cluster similar types of activity and outputs produced from policies, strategies and coordination effort. Or, said another way, to consider the conditions for success. Articulating mechanisms therefore means understanding the combination of resources (activities and ways of working), reasoning (the responses these provoke) and outcomes (the results that are achieved) in the form of Context-> Mechanism-> Outcome causal chains.

Interventions like ‘Just Transition’ are intended to encourage the target groups they are aimed at to make and sustain different choices – for example choosing to buy an electric vehicle. Making these choices requires a change in people’s ‘reasoning’ - the values, beliefs, attitudes, or the logic they apply to a particular situation. It also requires a change in the ‘resources’ actors have available to them. For example

³ Data is from 2023. Since publication, at least two major assets in Grangemouth have become publicly owned.

‘Just Transition’ could provide re-training programmes that help workers make the transition to greener jobs. This combination of ‘reasoning and resources’ is what enables Just Transition to ‘work’ and is defined as a ‘mechanism’. The way the mechanism works depends on the ‘context’ in which it operates. A re-training programme will work – or not – in different ways for different people depending on ‘contextual factors’ – like the time and economic resources available to deliver the programme.

In order to identify a list of representative Just Transition mechanisms relevant to Grangemouth, we first ranked those used in the national ToC in order of key priorities for the local context as it stands now (see Figure 9).

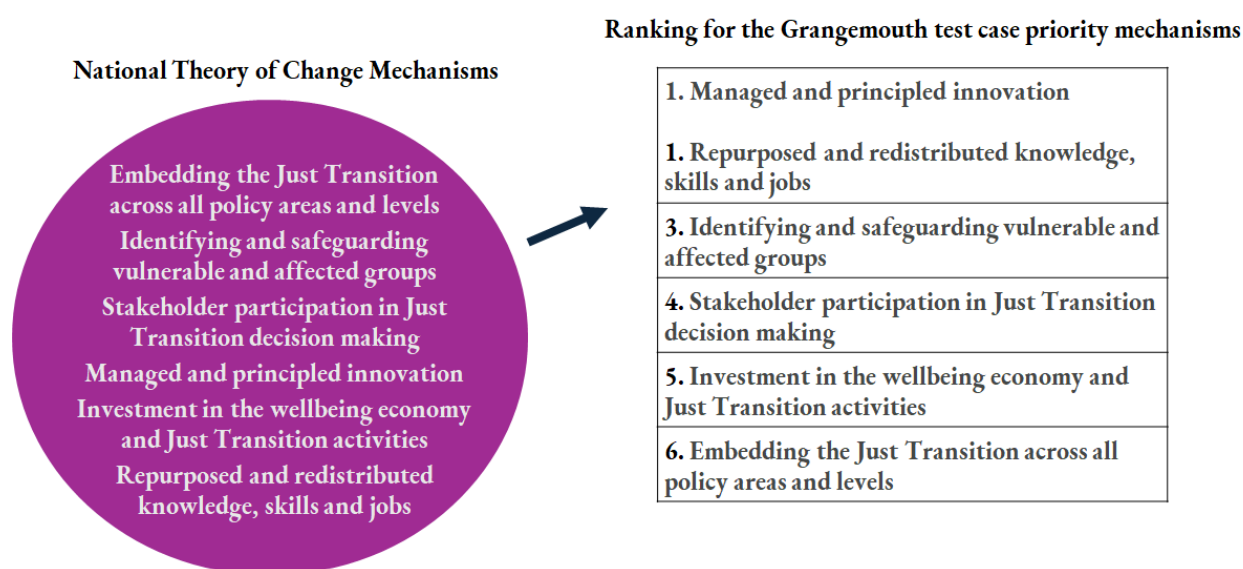


Figure 9: Comparison of the Scottish National Just Transition Theory of Change mechanisms with an initial ranking of the Grangemouth test case (Source: the authors)

We prioritised the mechanisms in terms of the most important actions that need to be undertaken to reach the priority outcomes in Grangemouth. Two mechanisms were ranked as equally important: managed and principled innovation and repurposed and redistributed knowledge, skills and jobs. This reflects the immediate need for central and local government coordination and innovation, and quick action on jobs and skills to avoid unfair outcomes for vulnerable and affected groups in Grangemouth.

In addition to ranking the mechanisms, we selected indicators using a similar process to that used for outcome measures: generation of bespoke measures that fit Grangemouth’s needs and current actions, alignment with the national ToC and GIJTP, followed by identifying superfluous measures and adaptation to available data (or data that plausibly could be generated). This allowed the selection of mechanism measures with strong goodness of fit, relevance, and data availability.

Since, where possible, we used measures from the national ToC and the Scottish Government’s GIJTP, the three sources of measures were not equally represented: 12 measures were adapted from the national ToC, one measure from the GIJTP and two bespoke local measures which were not covered elsewhere. As measures for mechanisms (or levers) were not proposed in the GIJTP, the majority of indicators were adapted from the national ToC. The full list of mechanism measures is presented in Appendix 3.

Whilst fewer data points were found for mechanism measures than for outcomes, a data dashboard was generated to provide an indication for the progress of the actions and outputs that might lead to a Just Transition in Grangemouth.

Deteriorating	Maintaining	Improving
	1.3 Assets created by decarbonisation being used creatively and for the benefit of the local Grangemouth population	3.1 Proportion of Grangemouth transition plans which include impact assessments on vulnerable and affected groups
	6.2 Proportion of Scottish Public Bodies in Falkirk that report and act upon Just Transition outcomes in their area.	3.2 Proportion of Grangemouth transition plans which include groups and provisions to safeguard vulnerable and affected groups

The dashboard shows some improvement and maintenance of process indicators in Grangemouth. However, in most cases the baselines are very low. For instance, measures 3.1, 3.2 and 6.2 were each compared against a baseline of zero, so that only marginal improvements were needed to show improvement. Sections 6.5.1 - 6.5.6 present the outputs in detail.

6.5.1 Managed and principled innovation

Managed and principled innovation: Planning for a ‘managed’ transition to net zero means that the risks associated with radical disruptive changes to the economy, as happened with de-industrialisation for example in the coal-mining sector, are reduced (Kaizuka, 2024). Concern for Just Transition ideas and outcomes are prioritised. Through Grangemouth-specific Just Transition planning, the inevitable trade-offs that will occur as a result of structural change will be effectively managed, leading to more equitable outcomes. This managed transition is reinforced through a

holistic, system-wide and sector-wide policy framework that provides ‘joined up’ benefits for Grangemouth, creating multiplier effects that contribute to increased community economic and social capital, whilst smoothing the impacts – both positive and negative – of the transition to reduce geographical and sectoral disparities.

Innovation that is guided by Just Transition addresses the dual imperatives of reducing carbon emissions and attaining just outcomes (Scottish Government, 2021). Managed innovation ensures that technological developments, such as biofuels production, are introduced in ways that prioritise worker protections, community benefits, and environmental safeguards. Innovations and interventions are designed according to Responsible Research and Innovation principles, ensuring that justice thinking is embedded at the stage of inception - where electric vehicle charging is accessible to disabled users, for instance. Managed innovation will stimulate a thriving private sector, which will create new business models based on equitable environmental sustainability within the workforce, supply chains, communities and the local environment.

Measure	Origin	Currently available data	Data source	Latest data	Progress
1.1 Social Innovation Index (SII) score for corporations operating in the Grangemouth Industrial Cluster	National ToC	Average SII scores for the main investors in the Grangemouth Industrial Cluster	Data not collected	N/A	N/A
1.2 Government funding allocated to Grangemouth innovation project pilots	National ToC	Government investments in feasibility studies and pilots in Grangemouth related to the low carbon transition	Data not collected	N/A	N/A
1.3 Assets created by decarbonisation being used creatively and for the benefit of the local Grangemouth population	Adapted from GIJTP	Population within 500 metres of a derelict site	Link	23% (2022)	Maintaining

6.5.2 Repurposed and redistributed knowledge, skills and jobs

Repurposed and redistributed knowledge, skills and jobs: Progress towards a Just Transition requires changes to knowledge, skills, jobs, work practices and organisational culture alongside training provision (Pinker, 2020). These changes are delivered in managed, intentional and equitable

ways, so that they meet employer demands; they don't leave anyone behind, and they contribute to reducing inequalities, particularly for Grangemouth given its historical dependence on carbon-intensive industries. Changes are implemented through a combination of protection of jobs in areas least affected by transition; managed adaptation or transformation of existing jobs that require repurposing, and retraining and reskilling in sectors radically affected by the movement to net zero (Skills Development Scotland, 2020). This enables the reallocation of skills and knowledge from high-carbon to low-carbon sectors helps to ensure that workers participate in emerging green economies. Concern is not just for the quantity of jobs, but for the parity of pay and conditions that enable a "good job", including "better and decent work, social protection, more training opportunities and greater job security for all workers affected by global warming and climate change policies" (Eurofund, 2024).

Through the implementation of the Grangemouth Industrial Skills offer and other related activities, an overarching approach for managing the skills and jobs transition implements joined up, cross-sectoral actions to ensure that gradually, people in and around Grangemouth acquire the knowledge and skills they need to engage with and benefit from the transition while putting in place safety nets. This provides a framework for delivering targeted actions including a skills guarantee for workers in carbon-intensive sectors; new models of apprenticeship in sectors that are pivotal to the transition, and increased opportunities for more people, particularly women, to gain qualifications, training and employment in the key transition sectors including on the land and in aquaculture.

Measure	Origin	Currently available data	Data source	Latest data	Progress
2.1 Average number of annual learning hours spent on training and education for those working in the Grangemouth Industrial Cluster	National ToC	Proportion of adults who work in affected industries in Grangemouth who participated in learning in the past four weeks	Data not collected	N/A	N/A
2.2 Annual learning hours spent on training and education for Grangemouth residents in vulnerable groups	National ToC	Proportion of adults from vulnerable groups in Grangemouth who participated in learning in the past 13 weeks	Data not collected	N/A	N/A

2.3 Proportion of high-carbon businesses in Grangemouth who are regulated to protect and support their workforce during transition activities	National ToC	Proportion of high carbon businesses with collective agreements OR covered by specific policies to safeguard and support their workforce	Data not collected	N/A	N/A
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6.4.3 Identifying and safeguarding vulnerable and affected groups in and around Grangemouth

Identifying and safeguarding vulnerable and affected groups: A commitment to a just and equitable distribution of opportunities, costs and benefits is centralised within the Just Transition vision and strategy. This entails identifying and safeguarding vulnerable and affected groups to achieve Just Transitions goals without exacerbating existing inequalities or creating new ones. The Just Transition approach avoids putting a narrow focus on particular ‘at risk’ groups, such as solely focusing on workers in carbon-intensive industries, and is also rooted in the wider consideration of a fair distribution of costs and benefits for all stakeholders in the Grangemouth and Falkirk area as a whole (Abram et al., 2022). This includes recognising low-income populations and marginalised groups, for instance, who also face significant risks as a result of the net zero transition. Without proactive measures, these groups could experience job loss, reduced income, and community displacement amongst other negative outcomes, which could deepen pre-existing socioeconomic disparities (Banerjee and Schuitema, 2022). The effective identification of affected groups enables targeted interventions that address the unique challenges they face, ensuring that they are equipped to participate in and benefit from new opportunities within low-carbon sectors. This prioritisation not only supports social justice but also fosters a more inclusive and resilient economy, as all individuals and communities are given the opportunity to thrive throughout the transformation.

The identification of vulnerable and affected groups comes alongside a commitment to social protections and safeguards, including, for instance, job retraining programs, social safety nets, and community support initiatives. Actions such as investment in energy efficiency and fuel poverty programmes and the provision of local support and advice at the community level, provide the foundation for an equitable transition that leads to broader social and economic benefits such as a significant reduction in child poverty. Other activities reinforce this primary objective of a just and fair transition.

Measure	Origin	Currently available data	Data source	Latest data	Progress
3.1 Proportion of Grangemouth transition plans⁴ which include impact assessments on vulnerable and affected groups	National ToC	Proportion of Grangemouth transition plans which contain specific sections outlining potential impact on both vulnerable and affected groups	SG and JTC websites	25% (2024)	Improving
3.2 Proportion of Grangemouth transition plans which include groups and provisions to safeguard vulnerable and affected groups	National ToC	Proportion of Grangemouth transition plans which contain specific sections outlining any provisions to safeguard both vulnerable and affected groups	SG and JTC websites	50% (2024)	Improving

6.5.4 Stakeholder participation in Just Transition decision making

Stakeholder participation in Just Transition decision making: Stakeholder participation is a cornerstone of decision-making for a Just Transition in and around Grangemouth, ensuring that policies and practices are inclusive, equitable, and responsive to the needs of all vulnerable and affected communities including workers, local communities and businesses. Participation is not just tokenistic, but ensures that stakeholders are engaged in transparent decision-making processes that allow participants to express their concerns, contribute their insights, and meaningfully shape emancipatory outcomes (Manteaw, 2007). Processes and outcomes are kept under review, such that public engagement is not used to maintain the status quo or unequal distribution of burdens and benefits, but complements Just Transition outcomes (Subtoicki et al., 2023).

Attention is given to the nature of and burden associated with stakeholder participation, recognising that whilst not all stakeholders will participate, they should be given the choice and capacity to do so. Opportunities for participation are also diverse and groups that are marginalised, hard-to-reach, or have minority views are actively sought (Abram et al., 2020). Lay knowledge and traditional knowledge is explicitly acknowledged and welcomed, including that from “experts by experience”. Where decisions are required on complex issues with complex outcomes, methods such as Citizens Juries are used to bring together randomly selected people who represent the relevant community, broadening the range of voices reached (Saarikoski et al., 2023). Elsewhere, the roll-out of Regional Land Use partnerships and similar mechanisms that involve collaboration between local (and

⁴ Any decarbonisation/re-naturing plan published or funded by a government agency such as a Public Body.

national) government, communities, land owners, land managers, and other stakeholders including citizens groups, optimises the fair and equitable use of land to meet transition objectives. For Grangemouth, this means consideration of land use opportunities where they haven't previously been considered an applicable concern.

Stakeholder participation also helps to identify local challenges and opportunities, ensuring that transition strategies are tailored and targeted, creating the conditions for deliberative justice, place-based determination of outcome and democratic control. It also creates a collaborative environment where decisions reflect multiple perspectives, thereby enhancing the social legitimacy and sustainability of the Just Transition (Upham et al., 2022). Overall, by prioritising stakeholder participation in decision making, a Just Transition not only promotes shared ownership of the transition process but facilitates the transformation.

Measure	Origin	Currently available data	Data source	Latest data	Progress
4.1 Proportion of Just Transition activities in Grangemouth that fulfil minimum requirements of the STEP index	National ToC	Just Transition activities (at local and intervention level) which consult stakeholder groups (residents, unions/workers, companies, and local authorities) in both planning and implementation, for example, projects from Project Willow, using the STEP Index	Data not collected	N/A	N/A
4.2 Existence of ongoing opportunities for participation in Grangemouth beyond specific interventions and plans	Bespoke	Presence for stakeholder groups and forums that facilitate direct community engagement in ongoing, longer-term Just Transition processes and outcomes	Data not collected	N/A	N/A

6.5.5 Investment in the wellbeing economy and Just Transition activities

Investment in the wellbeing economy and Just Transition activities: New and innovative forms of low-carbon investment into the wellbeing economy enable the diversification of economic activity “to attend holistically to a range of issues beyond job substitution and retraining, such as new infrastructures, the development of new green industries, and educational initiatives, amongst others” (Pinker, 2020 pg. 3). Through Just Transition activities, investment is widespread and focuses on

establishing robust Just Transition outcomes and a wellbeing economy (Just Transition Commission, 2024c). This sees, for instance, finance for nature-based solutions to climate change mitigation and adaptation; the upscaling of public transport provision supplemented by zero emissions vehicles; investments in local authority capacity, and direct investments in decreasing local social inequalities such as improved access to green spaces and health services. Investments are made by a range of public and private stakeholders, including financial institutions such as government bodies and agencies, local authorities, individuals and communities, reducing the reliance on market-based approaches (Just Transition Commission, 2024c). Investments will lead to improvements in quality of life and in community capital and vibrancy, which will in turn contribute to reducing economic, social and spatial inequalities in Grangemouth and the surrounding area and increased wellbeing.

Low-carbon investment comes alongside stakeholder engagement so that there is a concern not just for financing, but for the procedures through which it takes place. This includes engagement with any affected workers, communities and others impacted by the process of investment and the resultant transition. Consultation and dialogue supports orderly and managed investments and transformational change, including mitigating the risks of social tensions, conflict and business disruption (Clifford Chance, 2024). Investment focuses not just on quantity in terms of access to finance, but quality, considering the geographical location and environmental and social performance of the investment (Just Transition Commission, 2024c). This includes attention to frameworks such as the Principles for Responsible Investment.

Measure	Origin	Currently available data	Data source	Latest data	Progress
5.1 Annual public investment on activities categorised as related to the wellbeing economy and the Just Transition in Grangemouth	National ToC	Data should be categorised and collated on annual public investment on Just Transition and wellbeing economy in Grangemouth	Data not collected	N/A	N/A
5.2 Annual private investment on activities categorised as related to the wellbeing economy and Just Transition in Grangemouth	National ToC	Data should be categorised and collated on annual private investment on Just Transition in Grangemouth	Data not collected	N/A	N/A

6.5.6 Embedding the Just Transition across all local and regional policy areas and levels

Embedding the Just Transition across all policy areas and levels: By embedding the Just Transition across all policy areas and levels, Grangemouth and the Industrial Cluster contributes to a cohesive, coherent policy framework that aligns climate action with socially and environmentally just outcomes. The cross-sectoral, horizontal approach considers all implicated policy areas, including energy, housing, education, transport, and land use (Slee, 2024). This helps to ensure that initiatives such as retraining programs or regional development investments have widespread policy support and impact, facilitating the transferability of jobs and skills from one sector to another, for instance. Strategic focus is given both to ensuring that policies are context-specific and democratically accountable, and that areas of tensions, trade-offs and contestation are managed across different policy levels, fostering a fairer and more inclusive approach overall (Malakar et al., 2024).

Measure	Origin	Currently available data	Data source	Latest data	Progress
6.1 Proportion of Corporations in the Grangemouth Industrial Cluster that report and act upon Just Transition outcomes in their area	National ToC	Proportion of Corporations who mention Just Transition in their CSR and other reporting insert link to example report	Data not collected	N/A	N/A
6.2 Proportion of Scottish Public Bodies⁵ in Falkirk that report and act upon Just Transition outcomes in their area	National ToC	Proportion of Scottish Public Bodies in Falkirk (Falkirk Council, Falkirk IJB and Forth Valley College) who mention Just Transition in SSN reporting Reports	Link	0 (2024)	Maintaining
6.3 Representation of all relevant stakeholder types⁶ on Grangemouth Just Transition decision making bodies	Bespoke	Proportion of the 8 JT stakeholder group types which are represented on both the Industrial Leadership Forum and Grangemouth JT Programme board	Link	88% (2024)	N/A

⁵ Public Bodies in Scotland are 210 organisations including all Local Authorities, Educational Institutions (colleges and universities), Integration Joint Boards, NHS bodies, Transport Partnerships and others.

⁶ As shown in figure 5, these types are Local Authority, Community Groups and Third Sector, Industry, Unions, Education/Training, Knowledge and subject expertise, National Organisations and Government Agencies, and Local Stakeholders.

7. Lessons on adapting the framework to Grangemouth

The aims and objectives for this report are to (1) apply the ToC approach to the Grangemouth case to identify shortcomings (e.g., data availability, suitability at different scales, or the unsuitability for some places), (2) identify what is practical and achievable now in terms of Just Transition monitoring and evaluation approaches for Grangemouth and refine the ToC approach where required, and (3) to compare and contrast with the monitoring and evaluation approach set out by Scottish Government in the Grangemouth Just Transition plan. This section brings together these aims to understand the lessons that can be taken from this adaptation and translation

7.1 Adapting from national to local scale

Before we compare our application of the national Just Transition ToC to the Grangemouth case with the Grangemouth Industrial Just Transition Plan, we offer several reflections related to the shortcomings of our frameworks and what is currently practical and achievable for monitoring and evaluation Grangemouth's Just Transition:

- 1) We have focused on a translation of the ToC to the Grangemouth test case rather than the creation of a full Grangemouth ToC (as per Figures 7 and 8). Using the national framework as a baseline demonstrates that (a) the national approach can actually be scaled down, and (b) developing a separate ToC for Grangemouth without using a 'baseline' model would be a complex process requiring specific skills and expertise that may not be available in every organisation, making that approach more limiting. The success of this work implies that developing a new ToC from scratch is not required when developing a Just Transition monitoring and evaluation framework where a national framework exists. As the national framework modelled how different actions and mechanisms led to particular outcomes and impacts, in the future other local/regional/sectoral applications can use this national framework, even to infer causal relationships.
- 2) For the Grangemouth test case, we have retained the same overarching framework as the national ToC - that is, the same outcome clusters and all mechanisms -, but have adapted their contents. This means that the factors considered are more diverse than other evaluations may cover (see also Section 7.2). Positively, this represents a wide range of Just Transition concerns. However, it also increases the workload associated with and practicalities of Just Transition monitoring and evaluation. Therefore, in each applied case we recommend the selection of two or three key indicators which are the most representative, direct measures of localised Just Transition concerns.

- 3) Some of the indicators selected at the national level did not have data with the level of granularity to represent Grangemouth and the surrounding areas, meaning that they were substituted for alternatives (direct or otherwise). This includes the integration of indicators/measures recommended in the GIJTP. In practice, this will present a challenge in comparing datasets across different levels of applications and may signal opportunities to improve or refine various datasets to aid their comparability at different scales (as would be the case, for instance, with the Scottish Index of Multiple Deprivation).
- 4) At the Grangemouth test case level (as was the case with the national ToC), some indicators lack direct data and so remain to be fulfilled by future data collection. Whilst such data should be possible to collect, in practice it may be that the strategic engagement and organisational work required to collect this data may never occur and so some indicators may never be measured.
- 5) Much of the discourse around the Grangemouth refinery transition relates to “high-quality” “good”, “green” jobs. However, the meaning of these terms is subjective and consistent definitions are lacking. Given this subjectivity, it has proven challenging to identify appropriate indicators despite the centrality of these concerns.
- 6) There is merit in a qualitative approach to Just Transition monitoring and evaluation e.g., to collect qualitative assessments from stakeholder groups (residents, unions/workers, companies, and local authorities) on how satisfactory stakeholders found a consultation process (as was proposed in Phase One). However, this qualitative data is typically more time- and cost-intensive to collect and is gathered less systematically (despite its clear merit in representing the views of vulnerable and affected groups and processes such as participation, for instance). Accessing qualitative forms of data requires adequate funding and capacity and yet will result in data that may not be readily comparable with other contexts. Instead, it may be useful for longitudinal case-based data collection and for achieving Just Transition processes in and of themselves.
- 7) This work provides a clear framework for monitoring the success of the Just Transition in Grangemouth. In selecting quantifiable data sources and presenting dashboards of progress, we may lead the reader to conclude that the test case is for monitoring only. We would like to emphasise that monitoring data alone will not provide a meaningful analysis of the Just Transition process and outcomes, and that policy makers and evaluators can use the framework equally to design and evaluate individual programmes and aspects of the Just Transition in Grangemouth.

7.2 Comparison with Scottish Government planning and evaluation

The Grangemouth Industrial Just Transition Plan (GIJTP) describes desired outcomes for the Grangemouth Industrial Cluster and the surrounding town, guided by the Scottish Government's National Just Transition Planning Framework. In this section, we compare and contrast the approach set out in this Scottish Government document with the test case approach, flagging key areas for improvement/gaps as well as ways to bridge these gaps. The results of this mapping exercise can also be seen in Appendix 1.

The Grangemouth Industrial Just Transition Plan sets out, as the title suggests, an industry focused vision for Grangemouth. The vision is described as “a clear direction towards transforming Grangemouth into a carbon-neutral hub by 2045, focusing on five pillars: capitalising on existing industrial strengths; developing a low-carbon fuel and energy hub; becoming an important destination for carbon capture; leading in bio-manufacturing; and pioneering new industrial processes.” This sits in contrast to the ultimate aim in this test case document, which states “Grangemouth’s decarbonisation is just in process and outcome, and higher wellbeing is enabled by effective governance, local investment, and high value employment. Society is more cohesive whilst Grangemouth achieves environmental aims including net zero and improved air quality by 2045.” This contrast in scope and perspective - industrial facility versus a place-based Just Transition approach - is the main subject of our comparison.

7.2.1 Outcome clusters

Whilst the GIJTP assumes Grangemouth is synonymous with industry and its future is industrially (and ideally energy) focused, the Just Transition is conceived more broadly in the Grangemouth test case application. This is shown clearly in the comparison between desired outcomes in the GIJTP and the test case. There are several areas of overlap between the types of outcomes in both frameworks, which are shown in Figure 10 below. These common areas include jobs and skills, community, empowering people, and environmental aims. There is less overlap in the overall categories in four other areas, which are covered in the test case but not the GIJTP. These four areas relate more to outcomes for vulnerable groups (avoid entrenching old injustices or creating new ones, addressing financial injustice, and addressing spatial injustice) and process-related outcomes (a stronger democracy).

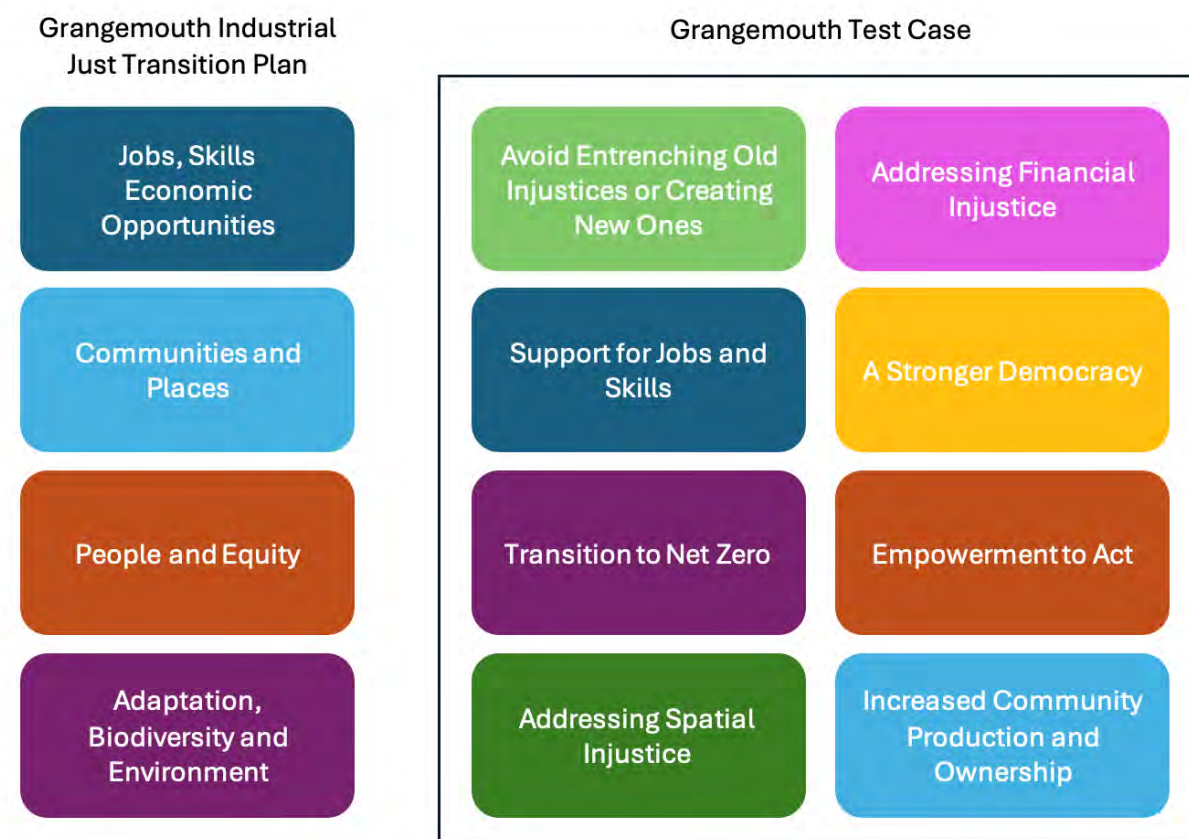


Figure 10: Comparison of Outcome Clusters listed in the Grangemouth Industrial Just Transition Plan versus the Grangemouth test case Theory of Change Translation (Source: the authors)

7.2.2 Transition levers and mechanisms

The Grangemouth Industrial Just Transition Plan’s eight transition levers (strategy and governance, sustainability, skills development, finance, innovation, supply chain optimisation, place development, and communication strategies) outline 23 proposed actions. Figure 11 shows the levers compared against the Grangemouth test case mechanisms. Table 3 shows these 23 actions mapped against the six mechanisms from our national Theory of Change, illustrating a strong alignment with “managed and principled innovation”, but limited engagement with worker and community focused engagements including identifying and safeguarding vulnerable and affected groups, stakeholder participation, investment in the wellbeing economy and Just Transition activities and repurposed and redistributed jobs and skills.

Grangemouth Industrial Just Transition Plan Levers



Grangemouth Test Case Mechanisms



Figure 11: Comparison of Levers listed in the Grangemouth Industrial Just Transition Plan versus the Grangemouth test case Theory of Change mechanisms (Source: the authors)

Proposed actions	Mechanism 1: Embedding the Just Transition across all policy areas and levels	Mechanism 2: Identifying and safeguarding vulnerable and affected groups	Mechanism 3: Stakeholder participation in Just Transition decision making	Mechanism 4: Managed and principled innovation	Mechanism 5: Investment in the wellbeing economy and Just Transition activities	Mechanism 6: Repurposed and redistributed jobs and skill
Strategy and Governance	1			1		
Sustainability and Decarbonisation				5		
Jobs and Skills						2
Finance				3		
Place	1		3	1	1	
Supply Chain Ecosystem				3		
Communication	2					
Totals:	4	0	3	13	1	2

Table 3: Proposed action clusters from the Grangemouth Industrial Just Transition Plan mapped against the mechanisms from the Grangemouth test case (Source: the authors)

7.2.3 Take-aways from the comparison

Whilst Section 7.2 has explicitly addressed the comparison between the Grangemouth Industrial Just Transition Plan and the test case application of it, this comparison is also echoed across earlier sections through the integration of indicators used within both sets of documentation. Here we offer selected reflections on the outcomes of the comparison:

- The Grangemouth Industrial Just Transition Plan is, by name, industrially focused. In comparison, and as justified above, in following the nation ToC we take a broader lens. This presents different scopes e.g., the test case application includes consideration of community ownership whereas the industrial strategy plan does not.
- Table 3 showcases proposed action clusters from the Grangemouth Industrial Just Transition Plan mapped against the mechanisms from the Grangemouth test case, illustrating that most attention is given to the “managed and principled innovation” mechanism. This demonstrates the limited reach of proposed actions and may serve as a reference point for planning subsequent Just Transition interventions with a broader scope. Greater emphasis could be placed on identifying and safeguarding vulnerable and affected groups, for instance, as a core Just Transition concern.
- A broader scope, whilst it arguably may represent a fuller spectrum of Just Transition concerns, may be harder to operationalise and may implicate a broader set of tensions and trade-offs. In policy-terms, it will also require greater cross-departmental working, collaboration and coordination.
- In both approaches, there is a risk of narrowing the range of future outcomes e.g., by emphasising the continuation of an industrial presence in Grangemouth, this may limit Just Transition visions and potential outcomes related to a non-industrial or post-industrial future (though this is not to say that in the near term, the industrial elements shouldn’t be emphasised).
- In the GIJTP, there is evidence of a disjuncture between the pillars, levers and outcomes (see Appendix 4). The five pillars of (1) capitalising on existing industrial strengths; (2) developing a low-carbon fuel and energy hub; (3) becoming an important destination for carbon capture; (4) leading in bio-manufacturing; and (5) pioneering new industrial processes are not mapped against the levers, actions or outcomes, for instance, making the links or casual chains between them unclear. Our Mechanism → Outcome cluster pathways are arguably more transparent.
- Of the six mechanisms we present, only managed and principled innovation receives significant attention in the GIJTP (as shown in Table 3) showing that whilst this mechanism is well understood, the others may be neglected. As mechanisms, or levers as they are called in the

GIJTP, set the conditions through which the actions and outcomes can occur, these can be more fully mapped.

- Central to the attainment of a Just Transition for Grangemouth and the surrounding area is both trust in institutions and organisations *and* hope. Both the GIJTP and test case applications are currently limited in their capacity to track this more subjective measure.
- The GIJTP includes some indicators for stated outcomes where the relationship is not fully transparent. The outcome of “costs of industrial decarbonisation are shared fairly on the basis of ability to pay” is linked to indicators on “percentage households reporting financial difficulties” and “population income deprived”, for instance. This would be considered an indirect measure where it was hard to evidence which intervention had influenced changes in this indicator. This points to opportunities to refine the indicators, potentially through the collection of new data.
- Key to the Just Transition is a concern for vulnerable and affected groups. Whilst a focus on workers as reflective of this, narrowing discourses and evaluations to consider them alone will likely miss (a) other groups of concern, and (b) other intersectionalities which may make some workers comparatively more vulnerable than others e.g., they are nearing retirement age or are from an already marginalised group. Therefore, both approaches can be refined in terms of their capacity to capture vulnerable and affected groups. We note, here, recent work undertaken in Wales to develop a Just Transition Relative Vulnerability Index (Oliver et al., 2025) which could be adapted in contexts such as Grangemouth to identify and safeguard vulnerable groups.

8. Overall reflections on Grangemouth and Scotland's Just Transition

The Grangemouth case study reveals three key lessons for both the application of the Just Transition ToC and the management of Scotland's Just Transition more generally: the importance of timeliness, of accountability and responsibility and of place-based approaches.

8.1 Timeliness

As discussed in Section 4, the process of deindustrialisation in Grangemouth has a long history spanning multiple decades. Therefore, whilst the recent announcement of job losses have raised particular concern, the general trend of employment decline and precarity cannot significantly pre-date this change. Further, whilst details of the exact time scale and full extent of jobs to be terminated in the Industrial Cluster have taken a while to materialise, warnings were received in late 2023. This advance notice as well as a general awareness of ongoing industrial decline provided opportunities for interventions, monitoring and evaluation in advance. As it stands, workers face the prospect of several years of unemployment until the outcome of projects materialise such as those suggested by Project Willow (currently at feasibility study stage).

The lesson overall is the importance of a proactive approach, both in terms of how and when the ToC (or translated test case application) is applied to local contexts likely to undergo substantial change, and in terms of using this advanced notice to mobilise Just Transition mechanisms and actions to achieve desired outcomes. Lessons can be learnt in this regard from the decommissioning of the Ratcliffe-on-Soar coal powered power station in Nottinghamshire, England, the last coal powered station in the UK. Through a collaborative, coordinated process between employees, unions and other key stakeholders, every affected worker moved into a new job, enabled by funding and support for workers to reskill, retrain and find new jobs whilst ensuring ongoing plant operability (TUC, 2024). Ongoing delays and failures to act similarly will almost certainly have negative impacts for Just Transition outcomes in and around the Grangemouth Community. It is concerning therefore, that the draft Grangemouth Industrial Just Transition Plan is not finalised following consultation and in “delivery mode”.

With regards to the ToC, the issue of timeliness asks both for (1) its timely operationalisation so that the impact of events such as the closure of the Grangemouth oil refinery and associated impacts can be evaluated and monitored, and (2) refined emphasis around the expression of key mechanisms. This learning also has implications for the national framework. For instance, Mechanism 4 (Managed and principled innovation) could read “concern for Just Transition ideas and outcomes are prioritised with

a focus on anticipating critical junctures - e.g., the closure of major facilities - and timely interventions” and “managed innovation ensures that technological developments, such as renewable energy technologies, green manufacturing processes, and sustainable transportation systems, are introduced in **timely** ways that prioritise worker protections, community benefits, and environmental safeguards”.

8.2 Accountability and responsibility

The second key Just Transition issue evidenced by the Grangemouth case is that of accountability and responsibility. In the presentation of the national ToC, we suggested that a variety of stakeholders “might be considered as outcome, mechanism and measure ‘owners’”, where “outcome and mechanisms owners would be the groups responsible for enabling Just Transition action” and “Measure owners would be the groups responsible for reporting (and acting) on various areas”. For current Just Transition concerns surrounding Grangemouth, it is arguably the case that there has been a responsibility and accountability breakdown, with neither corporate interests, the government or other key stakeholders stepping forward to protect, retrain and redeploy the workforce (or, for a number of years, ensure community-wide local investment). This gap both reinforces the need for and challenges the use of the ToC. Through its implementation, the range of stakeholders implicated in Just Transition outcomes and impacts can be better understood. Moreover, through its monitoring and evaluation function it can be used to track whether interventions, or a lack thereof, are likely to lead to negative Just Transition outcomes (e.g., significant job losses), providing early warnings of failures and incentivising action from implicated stakeholders.

It must be noted that being implicated does not mean that those stakeholders will (or are in a position to) recognise that responsibility and act accordingly. This is to say that whilst the ToC and its local application can show likely outcomes and impacts, who they will affect, and who carries responsibility and accountability, there may be an evidence versus action gap. Therefore, alongside evaluation, monitoring and action in their own name, the Scottish Government and Parliament play a critical role in incentivising good Just Transition practice; be it through legislation, regulation, financial inducement or soft-power, there is a key role for evaluation, monitoring, oversight, *enforcement and relationship mediation*. This is a view supported by the workforce, who see positive outcomes for Grangemouth as primarily the responsibility of the Government (Just Transition Commission, 2024b) in lieu of stricter rules for large employers or where Just Transitions are viewed as a positive business case and opportunity for them. Where large-scale investments are made (such as those from the National Wealth Fund), it is critical that there is a clear definition of what constitutes an investment in Just Transition outcomes rather than investment more generally (Curran et al., 2022).

Overall, the Grangemouth case could be considered as a warning - an example where if you consider the planning Mechanisms (Embedding the Just Transition across all policy areas and levels; Identifying and safeguarding vulnerable and affected groups, and stakeholder participation in Just Transition decision making) *without* attention to coordination and investment mechanisms (Managed and principled innovation; Investment in the well being economy and Just Transition activities, and Repurposed and redistributed knowledge, skills and jobs), the Just Transition outcome will be negative and/or will miss opportunities.

8.3 Place-based industries

The literature on the Just Transition emphasises that it is spatially differentiated, context-specific and place-based (Weller et al., 2024). Whilst the Grangemouth Industrial Cluster dominates the local area in many ways and the focus of Grangemouth Industrial Just Transition Plan on the future of the industrial site is understandable, it is also limiting. The transformation of the Industrial Cluster will have many forms of impact on the local area, but is not the sole determinant of Just Transition outcomes for it. Just Transition in Grangemouth should consider more than the Industrial Cluster. It should also recognise debates on the historical context of continued deindustrialisation, and systemic economic marginalisation and disadvantage in Grangemouth. This includes consideration of the boundaries around Grangemouth, where its amalgamation with Falkirk District council affects the allocation of resources and distribution of localised wealth. High rates of socio-economic deprivation, for instance, are not only the result of job losses in the Industrial Cluster; high rates of fuel poverty are partially the result of high energy prices and the poor quality of local housing stock alongside local incomes, and opportunities for enriched biodiversity extend beyond the industrial site. It follows that discourses and plans around industrial Just Transitions must be embedded in the broad reality of place-based contexts, and Just Transition considerations for such contexts should be open issues beyond dominating industrial facilities.

The relationship between industry and the local community in Grangemouth has arguably degraded over several decades, with a lack of local prosperity gained from industrial activities. Whilst our indicative outcome cluster ranking reflects the centrality of employment concerns as being key to the current narrative, our retention of the wider Just Transition ToC lens recognises other socio-economic concerns *and* opportunities. This includes recognition of both the local history and culture formed by the Grangemouth Industrial Cluster, and the potential for a vision of Grangemouth that exists beyond it. That is to say, a Just Transition for Grangemouth need not necessarily mean the continuation of industrial processes (even ones compatible with low-carbon or net zero targets).

Place-based determinations of preferred Just Transition outcomes may lean towards radically different alternatives. Here, place-based applications require both (a) an awareness of a broad set of place-based concerns and (b) in line with the mechanism of “stakeholder participation in Just Transition decision making” and outcomes of a stronger democracy, empowerment to act, and increased community production and ownership, an openness to procedural mechanisms through which Just Transition aims are collaboratively determined. They may also require and/or enable (c) (social) entrepreneurship as an enabling factor (e.g., through community-based enterprises) (Manjon et al., 2022), in line with the mechanism of “managed and principled innovation”. Practically, such an approach also requires a long-term qualitative engagement to track mutual shaping of industry and context. Whilst this perspective cannot readily be quantified through indicators and metrics, it is nonetheless central to the long-term test case narrative for Grangemouth.

9. Conclusions and next steps

This report had three intended aims:

- 1) To apply M&E approach to the Grangemouth case to identify shortcomings (e.g., data availability, suitability at different scales, or the unsuitability for some places),
- 2) To identify what is practical and achievable now in terms of JT M&E approaches for Grangemouth and refine the M&E approach where required,
- 3) To compare and contrast with the M&E approach set out by Scottish Government in the Grangemouth Just Transition plan, flagging key areas for improvement/gaps between their planned approach and the JTC recommendations, as well as ways to bridge these gaps,

Throughout the report, we have offered reflections related to each of these aims. Here, we therefore focus down on key recommendations for the Scottish Government and for the Just Transition Commission, who are intended to use this report to facilitate their scrutiny of the Scottish Government.

- To **review the breadth of the approach taken**, recognising that whilst many Just Transition concerns are raised by the Grangemouth Industrial Cluster, wider Just Transition issues affect Grangemouth and the surrounding areas. The retention of the scope identified at the national level can ensure the representation of both place-based concerns, and that wider concerns and opportunities are acknowledged. Insights from place-based applications can then be used to refine the national ToC (see Figure 1).
- **Identify and map causal pathways**, where mechanisms inform actions that deliver outcomes related to the overall aim. This will ensure that the actions/interventions made will meaningfully influence the desired aim, as well as aiding the attribution of accountability and responsibility for each outcome.
- **Identify and specify mechanisms not just outcomes**, as these enable causal pathways and help to determine accountability and responsibility. This requires building on and refining the transition pillars and levers identified as part of the GIJPT and making the relationship between them clear.
- **Evaluation and monitoring should begin proactively**, recognising pressing Just Transition concerns and applications, so that the long-term impact of ongoing industrial transformations can be understood for local communities and environments.
- Outcome and mechanism **targets should be set for what success looks like in Grangemouth**. This document presents a monitoring and evaluation framework focused on

yearly change in measures, yet interim and final targets are needed to understand what a ‘just transition’ would look like. For example, there is a yearly improvement for the fuel poverty rate in Falkirk but 13,000 households remain in fuel poverty: what is the target number of households in fuel poverty in the next five years, ten years and to 2045? Having a set of targets for success for both outcomes and mechanisms would support accountability and provide a joined up vision for the Just Transition in Grangemouth.

- Where insufficient **accountability and responsibility** for Just Transition outcomes is being achieved, explore ways in which achievement of these results can be incentivised or enforced by external actors, including the Scottish Government itself.
- Acknowledging that on the whole, Just Transition interventions around the future of Grangemouth Industrial Cluster have been made too late, a **proactive approach should be taken to identify other upcoming place-based sites of concern**. This may, for instance, include Mossmorran or other large industrial hubs.
- As noted in the introduction, the rankings given in the report presents the authors’ views of Just Transition priorities for Grangemouth. These **rankings should be led by locally relevant stakeholders, either to validate or update them**. This requires a participatory process, which should also be open to deliberately determined Just Transition visions, including that the future for Grangemouth need not necessarily include the continuation of industry.
- **Localised test case applications should be used to inform and refine the national Theory of Change** (as per Figure 1), recognising that this should be kept “live” as Just Transition priorities evolve and emerge. This continued process of refinement will also allow the alignment and gathering of required datasets.
- **To widely communicate the vision held for the Just Transition and the approach used.** Our ethnographic fieldwork exposed limitations in the community’s understanding of the term Just Transition. At the same time, the Grangemouth case is illustrative of breakdowns in responsibility. To engender cross-stakeholder support, the vision and approach for the Just Transition must be clear and widely communicated so that it is widely understood and receives support. This will require new forms and styles of communication, including public outreach alongside a long-term commitment to meaningful participation, as outlined above.

This report was developed during a period of rapid change around the Grangemouth test case including several announcements of large-scale investments into the Industrial Cluster (e.g, the National Wealth Fund). We offer two final reflections in light of this rapidly developing backdrop. First, the quick succession of large-scale funding investments (and indeed, ongoing political public debate around the future of Grangemouth more generally) increases the importance of implementing a suitable monitoring and evaluation approach that can identify impacts and outcomes. This means that the

follow up to this report should be timely to ensure newly funded activities are impactful. Second, we have kept pace with investment announcements and tested the translated ToC approach in light of them. The indicators and measures remain appropriate and unchanged, demonstrating the validity of the approach as Grangemouth and other localities undergo continuous transformation.

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Appendix 1: Allocation of the proposed actions from the Grangemouth Industrial Just Transition Plan to the six Theory of Change Mechanisms

Mechanism 1: Embedding the Just Transition across all policy areas and levels

Strategy and governance: Create alignment and coordinated action between the UK Government, Scottish Government and local authorities on policy, strategy and funding for the Grangemouth Industrial Cluster.

Communication: In line with the Grangemouth Industrial Cluster Strategy, develop a distinctive brand identity and narrative to position the cluster with key audiences and stakeholders.

Communication: Develop and resource the delivery of a communication and marketing programme to promote the cluster – its ambition, goals, commercial opportunities, impact and benefits.

Place: Significantly increase the visibility, pace and ambition of the Greener Grangemouth Programme with a clear plan of realistic actions that deliver positive impact, build confidence and create momentum.

Mechanism 2: Identifying and safeguarding vulnerable and affected groups

No relevant actions identified in GIJTP

Mechanism 3: Stakeholder participation in Just Transition decision making

Place: Develop a place-based Just Transition Deal.

Place: Define and establish best practice community engagement guidelines for partners in the Cluster Strategy, to deliver a consistent approach to community empowerment in decision-making.

Place: Fund a recognised Community Engagement and Participation Manager, who will act as the local community champion, who will engage with communities and local leaders and influencers to raise awareness and empower the community.

Mechanism 4: Managed and principled innovation

Strategy and governance: Develop an industry-led technical and commercial investment strategy for the Grangemouth Industrial Cluster, aligned to Scottish and UK net zero targets, that attracts investment focused on economic, social and environmental benefit.

Sustainability and decarbonisation: Support and fund the delivery of Project Willow as a critical early part of the longer-term Industrial Cluster strategy, engaging and involving companies across the cluster.

Sustainability and decarbonisation: Establish a Grangemouth Regulatory Hub to support a Just Transition to net zero in 2024.

Sustainability and decarbonisation: Leverage the funding available until March 2025 through the UK Government Regulators' Pioneer Fund to trial novel approaches to regulation with the aim of supporting innovation of Industrial Cluster to net zero whilst continuing to protect people and the environment.

Sustainability and decarbonisation: Pursue additional funding routes to support a change in regulatory approach to support innovation and the Just Transition to net zero GHG emissions

Sustainability and decarbonisation: Develop a series of Just Transition conditionalities, to be applied to public funding for the Grangemouth Industrial Cluster.

Finance: Secure UK Government and Scottish Government funding for Project Willow and other early-stage scoping studies to underpin the long-term Grangemouth Industrial Cluster Strategy.

Finance: Develop and proactively promote a comprehensive and attractive investment proposition for the Grangemouth Industrial Cluster to attract private sector investment.

Finance: Maximise the value of existing government funding e.g., Green Freeport, Falkirk and Grangemouth Growth Deal, Stirling and Clackmannanshire City Region Deal, to ensure that the cluster is given required attention.

Supply chain ecosystem: Establish a supplier development programme backed by UK and Scottish governments and their agencies to build the capacity of SMEs to participate in the green economy.

Supply chain ecosystem: Create an annual Grangemouth Industrial Decarbonisation Expo held in Forth Valley, bringing together local, national and international companies to share knowledge, technologies and solutions.

Supply chain ecosystem: Harness the coordinated support of trade bodies and other supply chain support organisations by creating a specific campaign to promote the cluster strategy and opportunities at Grangemouth.

Place: Explore the development of a local Procurement Framework that encourages and incentivises operating companies to procure goods and services from local companies, working to enhance community wealth building.

Mechanism 5: Investment in the wellbeing economy and Just Transition activities

Place: Define and deliver a focused, time-bound study to develop a plan to improve public transport links, connectivity and accessibility around the Grangemouth Industrial Cluster.

Mechanism 6: Repurposed and redistributed knowledge, skills and jobs

Jobs and skills: Create a Grangemouth Industrial Skills offer in partnership with colleges, universities and standards bodies to deliver qualifications and training tailored to the needs of the transitioning economy.

Jobs and skills: Improve the coordination of initiatives across the Forth Valley, to ensure that the Grangemouth Industrial Cluster is given appropriate attention, as well as enhancing surrounding communities' access to opportunities.

Appendix 2: Full list of outcome data measures and their progress

Please note that underlined measures were adapted from the GIJTP.

Outcome	Measure	Currently available data for national measurement	Data source	2018	2019	2020	2021	2022	2023	2024	Change	Progress
O1 Avoid entrenching old injustices or creating new ones	1.1 No deterioration in any of the 25 sub-areas of Grangemouth according to the Scottish Index of Multiple Deprivation	Number of sub-areas of Grangemouth moving into one of the bottom deciles (20% or 10%) of most deprived areas in Scotland according to the SIMD	Link	3		0					0%	Maintaining
	<u>1.2 Average salaries in Grangemouth</u>	Average salaries for Grangemouth residents (Gross Weekly Pay - All Full Time Workers in Falkirk)	Link	£564.00	£561.30	£579.60	£593.20	£619.10	£683.70	£724.60	£40.90	Improving
	<u>1.3 Sense of pride and hope in Grangemouth</u>	Proportion of people in Falkirk who rate their neighbourhood as a good/very good place to live	Link	96%	96%			96%	92%		-4%	Declining
O2 Support for jobs and skills 1	2.1.1 Rate of people of working age in Grangemouth not in employment, education or training for affected areas	Percentage of working age adults (16-65 year olds) who are economically inactive in Falkirk (Annual population survey)	Link	22%	22%	22%	23%	20%	23%	25%	1.99%	Declining

Outcome	Measure	Currently available data for national measurement	Data source	2018	2019	2020	2021	2022	2023	2024	Change	Progress
O2 Support for jobs and skills 2	2.1.2 Participation in adult learning in Grangemouth	Number of people aged 16-64 - All people: Received job related training in last 13 weeks) Adult Participation in Learning Survey Falkirk	Link	16800	10900	11200	17500	22800	19500	21200	1700	Improving
	2.1.3 Total number of workers from Grangemouth Industrial Cluster who completed a training course in the past year	No data for Industrial Cluster	Data not collected									
	<u>2.2.1 Total jobs earning over real Scottish Living Wage in Grangemouth</u>	Average hourly pay for bottom 10 percent of workers in Falkirk	Link	£8.59	£9.00	£9.60	£9.50	£10.5	£11.65	£12.35	£0.70	Improving
	2.2.2 Ratio of jobs created to jobs lost in Grangemouth	No data, should measure balance of jobs created and jobs lost in Grangemouth Industrial Cluster	Data not collected									
	2.2.3 Job satisfaction for those working in Grangemouth industrial cluster	Not yet collected, should be composite of satisfaction with pay and benefits, employment contracts, work-life balance, job design and the nature of work, relationships at work, employee voice, and health and wellbeing	Data not collected									

Outcome	Measure	Currently available data for national measurement	Data source	2018	2019	2020	2021	2022	2023	2024	Change	Progress
O3 Transition to net zero	<u>2.2.4 Unemployment in Grangemouth</u>	Number of people modelled to be unemployed in Falkirk by the ONS	Link	3400	3100	2900	3500	2600	3100	2800	-300	Improving
	2.2.5 High-skilled occupations as a proportion of the workforce	Proportion of people working in high-skilled occupations (data for levels 1-3) in the workforce in Falkirk East	Link					41%	45%	38%	-7.2%	Declining
	<u>3.1 Annual GHG emissions in Grangemouth</u>	GHG emissions from Grangemouth Industrial Cluster in MtCO2e (Scotland data for 1A1b_Petroleum_Refining and 2B8g_Petrochemical_and_carbon_black_production:Other)	Link	4.42	3.69	3.69	3.21	3.48			0.27	Declining
	<u>3.2 Increase in average Air Quality Index (AQI) score in Grangemouth</u>	Total annual exceedances in Grangemouth (six monitoring locations) for SO2, NO2, PM10 and PM2.5 (for shortest recorded time periods possible) [LAQM monitoring]	Link	2	22	6	0	14	40		26	Declining
	3.3 Biodiversity in Grangemouth (terrestrial abundance of priority species)	No data (priority species identified in 'Second Nature: A Biodiversity Action Plan for the Falkirk Council area')	Link									

Outcome	Measure	Currently available data for national measurement	Data source	2018	2019	2020	2021	2022	2023	2024	Change	Progress
O4 Addressing spatial justice	4.1 Levelling up of most deprived 25 sub-areas of Grangemouth according to the Scottish Index of Multiple Deprivation	Proportion of sub-areas of Grangemouth in the bottom two deciles (bottom 20%) for multiple deprivation for the SIMD index	Link	24%		20%					-4%	Improving
	4.2 Development of clean, safe, green, and accessible public and private spaces in Grangemouth	Access to green/blue space in Grangemouth - % of people in Falkirk who live within 5 minute walk of nearest green/blue space	Link	46%	66%			80%	75%		-5%	Declining
	4.3 Reduced geographical differences in transport poverty in Grangemouth	Percent dissatisfied with the cost of bus fares in Grangemouth (Grangemouth Transport Study)	Link							58%		
O5 Addressing financial injustice	5.1 Percentage of households reporting financial difficulties in Grangemouth	Scottish Household Survey: % of households in Falkirk who answer "does not manage well" to the question "How the household is managing financially"	Link	5%	11%			10%	7%		-3.00%	Improving
	5.2 Prevalence of fuel poverty in Grangemouth	Number of dwellings in fuel poverty estimated by analyses from the Scottish House Condition survey for Falkirk	Link	16000	13000						-3000	Improving
	5.3 Prevalence of child poverty in Grangemouth	Local child poverty rates, After Housing Costs by Local Authority	Link	24.3 %	23.8 %	24.8 %	21.5 %	25.3 %	26.2 %		0.81%	Maintaining

Outcome	Measure	Currently available data for national measurement	Data source	2018	2019	2020	2021	2022	2023	2024	Change	Progress
O6 Stronger democratic process	<u>6.1 Effectiveness of GFIB (or its successor) as a forum for community to voice concerns regarding industrial transformation</u>	Not yet collected	Data not collected									
	6.2 CSR investment from corporations based in Grangemouth Industrial Cluster	Calculation of annual CSR funds spent in Grangemouth	Data not collected									
	6.3 People in Grangemouth feel able to influence decisions affecting their local area	Percentage of people who respond 'Strongly agree' or 'tend to agree' to 'Can you influence local decisions?'	Link	22%	13%			16%			3%	Improving
O7 Empowerment to act	7.1 People in Grangemouth are empowered to take action	Percentage of Grangemouth residents agreeing with the statement "This is a neighbourhood where local people take action to help improve the neighbourhood"	Link	46%	63%			56%	61%		5%	Improving
	7.2 People in Grangemouth would like to be involved in decision making	Percentage of people who "would like to be more involved in the decisions my council makes that affect my local area"	Link	31%	29%			37%			8%	Improving

Outcome	Measure	Currently available data for national measurement	Data source	2018	2019	2020	2021	2022	2023	2024	Change	Progress
O8 Increase in community ownership and production	8.1 Number of community or locally owned renewable energy installations/operational renewable energy capacity in community and local ownership (in absolute numbers and MW) in Grangemouth	Number of community or locally owned renewable energy installations/operational renewable energy capacity in community and local ownership (in MW)	Link						330			
	8.2 Number of assets in community ownership (any land, buildings and any other property of substantial value that a community group may own) in Grangemouth	Number of assets in community ownership (building only/land and building)	Link					0	0		0.00	Maintaining
	8.3 Local determination of use of unused and decommissioned sites in Grangemouth	Yearly consultations run on unused and decommissioned sites	Data not collected									

Appendix 3: Full list of mechanism data measures and their progress

Mechanism	Measure	Currently available data for national measurement	Data source	2018	2019	2020	2021	2022	2023	2024	Change	Progress
M1 Managed and principled innovation	1.1 Social Innovation Index (SII) score for corporations operating in the Grangemouth Industrial Cluster	Average SII scores for the main investors in the Grangemouth Industrial Cluster	Data not collected									
	1.2 Government funding allocated to Grangemouth innovation project pilots	Government investments in feasibility studies and pilots e.g., Project Willow and others	Data not collected									
	1.3 Assets created by decarbonisation being used creatively and for the benefit of the local Grangemouth population	Proportion of Falkirk's population living within 500 metres of a derelict site	Link	27%	26%		23%	23%			0%	Maintaining
M2 Repurposed and redistributed knowledge, skills and jobs	2.1 Average number of annual learning hours spent on training and education for those working in	Proportion of adults who work in affected industries in Grangemouth who participated in learning in the past four weeks	Data not collected									

Mechanism	Measure	Currently available data for national measurement	Data source	2018	2019	2020	2021	2022	2023	2024	Change	Progress
	the Grangemouth Industrial Cluster											
	2.2 Annual learning hours spent on training and education for Grangemouth residents in vulnerable groups	Proportion of adults from vulnerable groups in Grangemouth who participated in learning in the past sixteen weeks	Data not collected									
	2.3 Proportion of high-carbon businesses in Grangemouth who are regulated to protect and support their workforce during transition activities	Proportion of high carbon businesses with collective agreements OR covered by specific policies to safeguard and support their workforce	Data not collected									
M3 Identifying and safeguarding vulnerable and affected groups in and around Grangemouth	3.1 Proportion of Grangemouth transition plans which include impact assessments on vulnerable and affected groups	Proportion of Grangemouth transition plans which contain specific sections outlining potential impact on both vulnerable and affected groups	SG, JTC websites						0%	25%	25%	Improving
	3.2 Proportion of Grangemouth transition plans	Proportion of Grangemouth transition plans which contain	SG, JTC						0%	50%	50%	Improving

Mechanism	Measure	Currently available data for national measurement	Data source	2018	2019	2020	2021	2022	2023	2024	Change	Progress
	which include groups and provisions to safeguard vulnerable and affected groups	specific sections outlining any provisions to safeguard both vulnerable and affected groups	websites									
M4 Stakeholder participation in Just Transition decision making	4.1 Proportion of Just Transition activities in Grangemouth that fulfil minimum requirements of the STEP index	Just Transition activities (at local and intervention level) which consult stakeholder groups (residents, unions/workers, companies, AND local authorities) in both planning AND implementation, for example, projects from Project Willow, using the STEP Index	Data not collected									
	4.2 Existence of ongoing opportunities for participation in Grangemouth beyond specific interventions and plans	Presence for stakeholder groups and forums that facilitate direct community engagement in ongoing, longer-term Just Transition processes and outcomes	Data not collected									
M5 Investment in the wellbeing economy and Just	5.1 Annual public investment on activities categorised as related to the wellbeing	Public investment on Just Transition and wellbeing economy in Grangemouth	Data not collected									

Mechanism	Measure	Currently available data for national measurement	Data source	2018	2019	2020	2021	2022	2023	2024	Change	Progress
Transition activities	economy and the Just Transition in Grangemouth											
	5.2 Annual private investment on activities categorised as related to the wellbeing economy and Just Transition in Grangemouth	Private investment on Just Transition in Grangemouth	Data not collected									
	6.1 Proportion of Corporations in the Grangemouth Industrial Cluster that report and act upon Just Transition outcomes in their area	Proportion of Corporations who mention Just Transition in their CSR and other reporting insert link to example report	Data not collected									
	6.2 Proportion of Scottish Public Bodies in Falkirk that report and act upon Just Transition outcomes in their area	Proportion of Scottish Public Bodies in Falkirk (Falkirk Council, Falkirk IJB and Forth Valley College) who mention Just Transition in SSN reporting Reports	Link						0	0	0.00%	Maintaining
	6.3 Representation	Proportion of the eight JT stakeholder group types	Link							88%		
M6 Support for jobs and skills for the high- to low-carbon transition												

Mechanism	Measure	Currently available data for national measurement	Data source	2018	2019	2020	2021	2022	2023	2024	Change	Progress
	of all relevant stakeholder types on Grangemouth Just Transition decision making bodies	which are represented on both the Industrial Leadership Forum and Grangemouth JT Programme board										

Appendix 4 Distribution of activities by outcomes in the Grangemouth Industrial Just Transition Plan (GIJTP)

Pillars	Levers	Activity	Outcome cluster			
			Jobs, skills and economic opportunities	Adaptation, environment and biodiversity	People and equity	Communities and place
Capitalising on existing industrial strengths	Strategy and Governance	Industry led technical and commercial innovation strategy	X			
		Alignment and coordinated action between UK gov, Scottish Gov and local authority	X			
Developing a low-carbon fuel and energy hub	Sustainability and Decarbonisation	Support and fund the delivery of Project Willow	X			
		Establish a Grangemouth Regulatory Hub to support a JT to NZ in 2024		X		
Becoming an important destination for industrial carbon capture and storage across Scotland	Jobs and Skills	Develop Just Transition Conditionalities to be applied to public funding			X	X
		Establish a Grangemouth Industrial Cluster Skills offer	X		X	
Leading the development	Finance	Coordination of initiatives across the Forth Valley	X		X	
		Secure UK Gov and Scottish Gov funding for Project Willow and other initiatives	X		X	X

of bio-manufacturing Pioneering new industrial processes		Develop and promote a comprehensive and attractive investment proposition			X	
		Maximise the value of existing government funding			X	
	Place and community	Increase the visibility, pace and ambition of the Greener Grangemouth Programme		X	X	X
		Develop a plan to improve public transport links			X	X
		Develop a place-based Just Transition Deal	X	X	X	X
		Define and establish best practice community engagement guidelines			X	X
		Fund a community engagement and participation manager			X	X
		Explore the development of a local Procurement Framework	X		X	X
	Supply Chain Ecosystem	Establish a supplier development programme	X			
		Create an annual Grangemouth Industrial Decarbonisation Expo	X			
		Create a specific campaign to promote the cluster strategy	X			
	Communications	Develop a distinctive brand identity	X		X	X
		Delivery of a communication and marketing programme to promote the cluster	X		X	X

Appendix 5: Additional measures for Grangemouth

In the report above, only two or three measures were selected for each outcome and mechanism. However, while the selected measures in the report are perhaps the highest immediate priority, other measures were also designed which are currently less of an overall priority to Grangemouth but may be of use to different stakeholders or in the future as priorities shift. These draft measures are presented below.

Outcomes

Measure	Currently available data and source	Relevant outcome	Relevance to measure	Origin of indicator
There is no overall deterioration in salaries in Grangemouth	Average salaries for those working in the Grangemouth Industrial Cluster (mean, median and standard deviation)	1. Avoid entrenching old injustices or creating new ones	Direct measure	GIJTP/ bespoke
No increase in population prescribed drugs for mental health reasons		1. Avoid entrenching old injustices or creating new ones	Proxy	GIJTP
Proportion of companies operating in the Grangemouth Industrial Cluster who are Living Wage employers		2. Support for jobs		Bespoke
Parity of pay and conditions		2. Support for jobs		GIJTP
Percentage of workers in the GIC made redundant who become economically inactive upon cessation of their contract		2. Support for jobs		Bespoke

Workforce demographics to account for increased EDI in the transition		2. Support for jobs		
Average salaries in Grangemouth	Change in average salaries for Grangemouth residents (mean, median and standard deviation) Change in average salaries for those working in the Grangemouth Industrial Cluster (mean, median and standard deviation)	2. Support for jobs	Direct measure	GIJTP/ bespoke
Benefit claimant count		2. Support for jobs		GIJTP
Participation in life-long-learning in Grangemouth	No data	2. Support for jobs	Data gap	
Reduction of Grangemouth's carbon footprint expressed in million tonnes of carbon dioxide equivalent		3		National ToC
Long-term respiratory conditions outpatients	NHS Forth Valley	3		GIJTP
Survey about industrial operators' experience with Regulatory Hub		3		GIJTP
Reduced proportion of communities suffering polluted local environment	Change in the maximum 24 hour mean of PM2.5 (micrograms per cubic metre) per year by automatic measuring sites within local authorities (Annual Statistic Report)	3	Indirect/ Proxy measure	National ToC

Improvements in ratio of Gross Disposable Household Income (by local authority) to national Gross Disposable Household Income (Annual change) with ref to cost of living	Improvements in ratio of Gross Disposable Household Income (by local authority) to national Gross Disposable Household Income (Nomis Labour Market statistics)	4	Direct measure	National ToC
Reduced geographical differences in fuel poverty	Percentage of dwellings in Fuel Poverty by local authority, compared to Scotland average (Scottish House Condition Survey)	4	Proxy measure	National ToC
Reduced geographical differences in access to health services	Mean travel time (in minutes) to key services, by car or public transport per 2011 Data Zones (geographic areas) (statistics.gov.scot : Scottish Index of Multiple Deprivation)	4	Proxy measure	National ToC
Increased resilience of properties at risk of flooding	Proportion of properties at risk of flooding which have Property Flood Resilience (Property flood resilience)	4	Direct measure	National ToC
Population which is income deprived		5		GIJTP
Population in good housing	Scottish Housing Condition survey	5		GIJTP
Responsible parties are accountable during the transition		6		Bespoke
Local companies are good at listening before taking decisions		7		GIJTP/ adapted
Number of fulfilled community participation requests	Number of successful community participation requests per year to Falkirk	7	Direct measure	National ToC

	Council (Participation Requests)			
Generally, people in Grangemouth feel able to influence their own lives and the future	Percentage of people who think, 'in general, the corporations in the GMIC are good at listening to people's views before taking decisions', by subgroups	7	Proxy measure	Bespoke
Area of community assets (in hectares)	Area of community assets (in hectares) (Community Ownership in Scotland 2022)	8	Direct measure	National ToC
Number of community groups on Scottish Communities Climate Action Network member directory based in Grangemouth		8		
Number of assets in community ownership (building only/land and building) in Grangemouth		8		
Local determination of use of decommissioned sites - consultations run		8		

Mechanisms

Measure	Currently available data	Relevant mechanism	Relevance to measure	Source
Number of sectoral and local Just Transition programmes being implemented	Number of sectoral and local Just Transition programmes being implemented (Publications – Just Transition Commission)	1	Direct measure	National ToC
Social Innovation Index (SII) score for top investors in low-carbon transition	Average SII scores for the main investors in the Grangemouth Industrial Cluster	1	Proxy measure	National ToC adapted

Degree of private funding allocated to low-carbon projects	Private funding realised in new Grangemouth investments, including investments made after feasibility pilots	1	Proxy measure	GIJTP/ adapted
Total grants given to education and training agencies and individuals for Just Transition activities taken up by businesses in the Grangemouth Industrial Cluster	Collated reports of grants given by central government and public bodies for training/education for those in affected industries (Publications – Just Transition Commission)	2	Direct measure	National ToC
Total grants given to education and training agencies and individuals for Just Transition activities taken up local colleges	Collated reports of grants given by central government and public bodies for training/education for those in affected industries (Publications – Just Transition Commission)	2	Direct measure	National ToC
Degree of financial investment in equality measures	Number of local grants made available for households and community projects for vulnerable and affected people in Grangemouth	3		Bespoke
Private investment leveraged in Grangemouth economic/industrial development and transition to net zero		5		GIJTP
Amount invested in climate mitigation and adaptation projects/ companies pursuing net zero-adjacent work at Grangemouth		5		GIJTP
Extent to which Falkirk Council reports and acts upon Just Transition outcomes in the local area.	Proportion of council documentation and reporting that engages with the Just Transition	6	Proxy measure	Bespoke



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