

The Unintended Consequences of Large Scale Actions

SUSTAIN Conference
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Outline

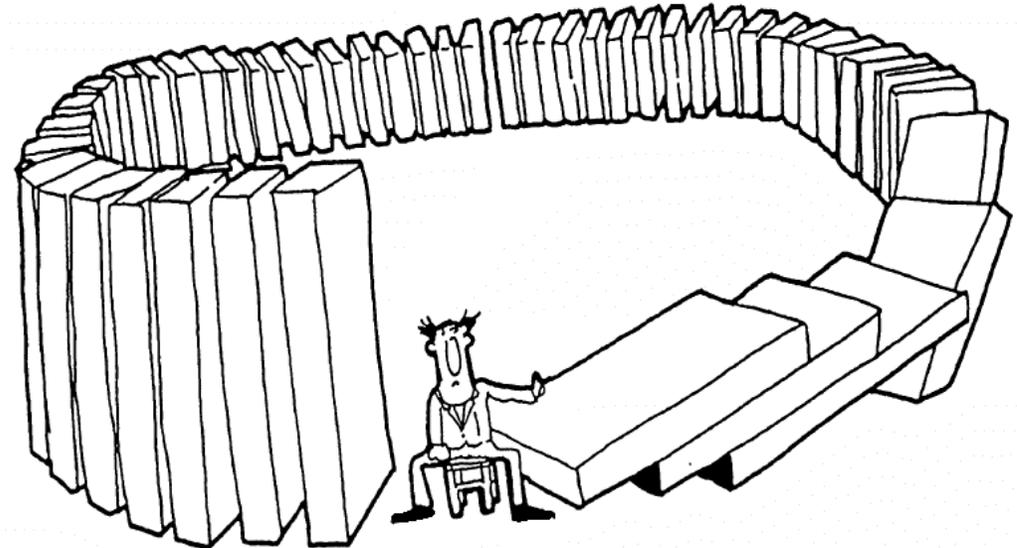
Introduction

Background

Methods

Steelworks case study

Conclusion



Introduction

- Unintended consequences are a self-evident part of life.
- They have been the subject of research in all fields for millennia, most prominently in philosophy, economics, and social theory.
- As humanity faces rapid, far-reaching and unprecedented changes in all aspects of society (UN, 2018) gaining a holistic understanding of the impacts supply chain actions have on sustainability is of increasing importance.
- This research asks why and how do unintended consequences arise from actions intended to improve sustainability?

Background

Types of unintended consequences

	Unintended	Intended
Desirable	Positive spillover	False progress
Undesirable	Negative spillover	Backfire

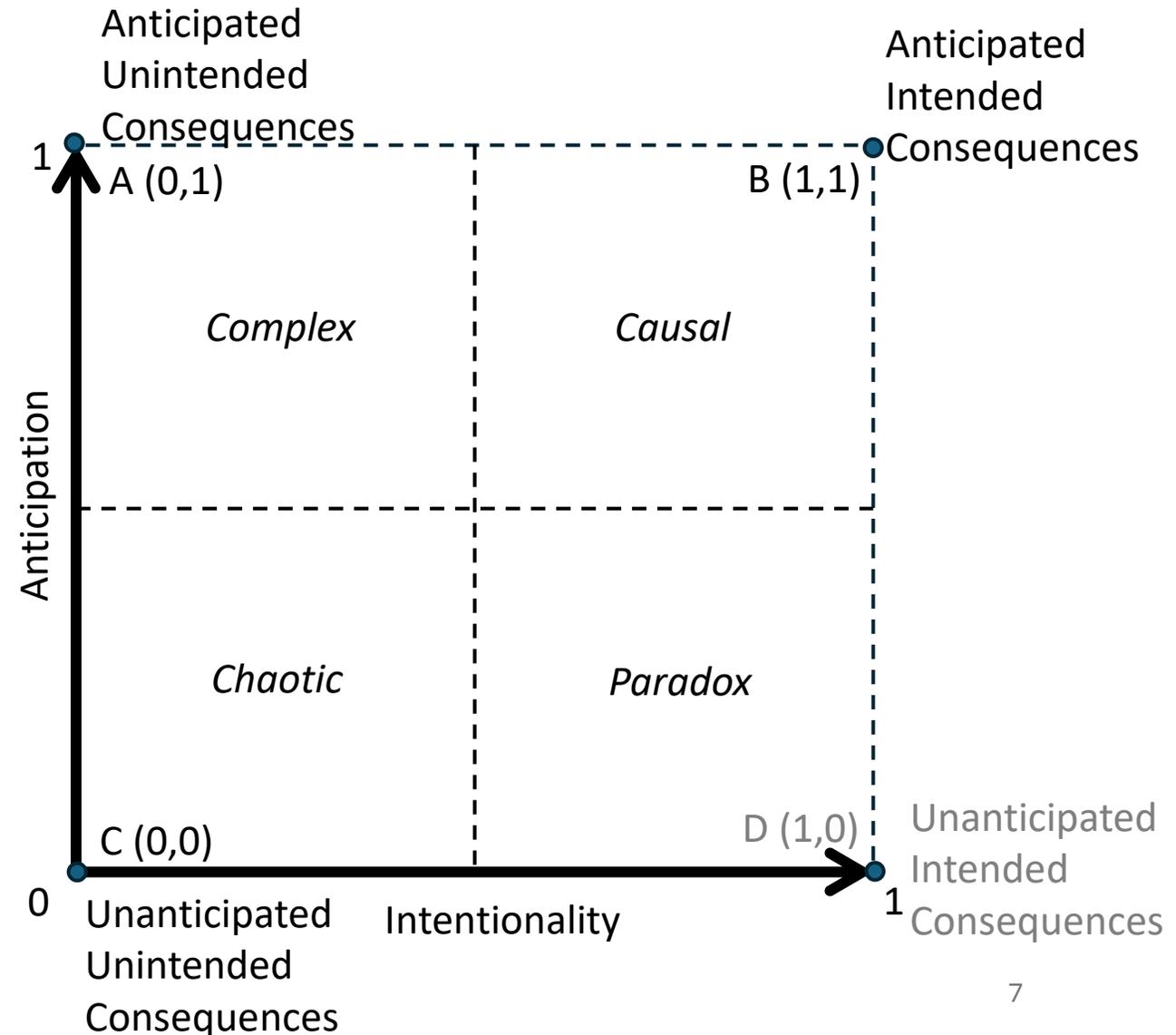
- Positive spillover - desirable effects on outcomes other than intention
- False progress - improvement in measure of intended outcome without true progress in intended outcome
- Negative spillover - undesirable effects on outcomes other than intention
- Backfire - negative progress on intention

Causes of unintended consequences

- When actors engage in ‘purposive social action’ to affect a certain end, these actions often do not produce the effects desired by the original actor for five reasons (Merton, 1936):
 1. Ignorance
 2. Errors in analysis
 3. Immediacy of interest (Short-term priorities)
 4. Basic values
 5. Self-defeating prophecies

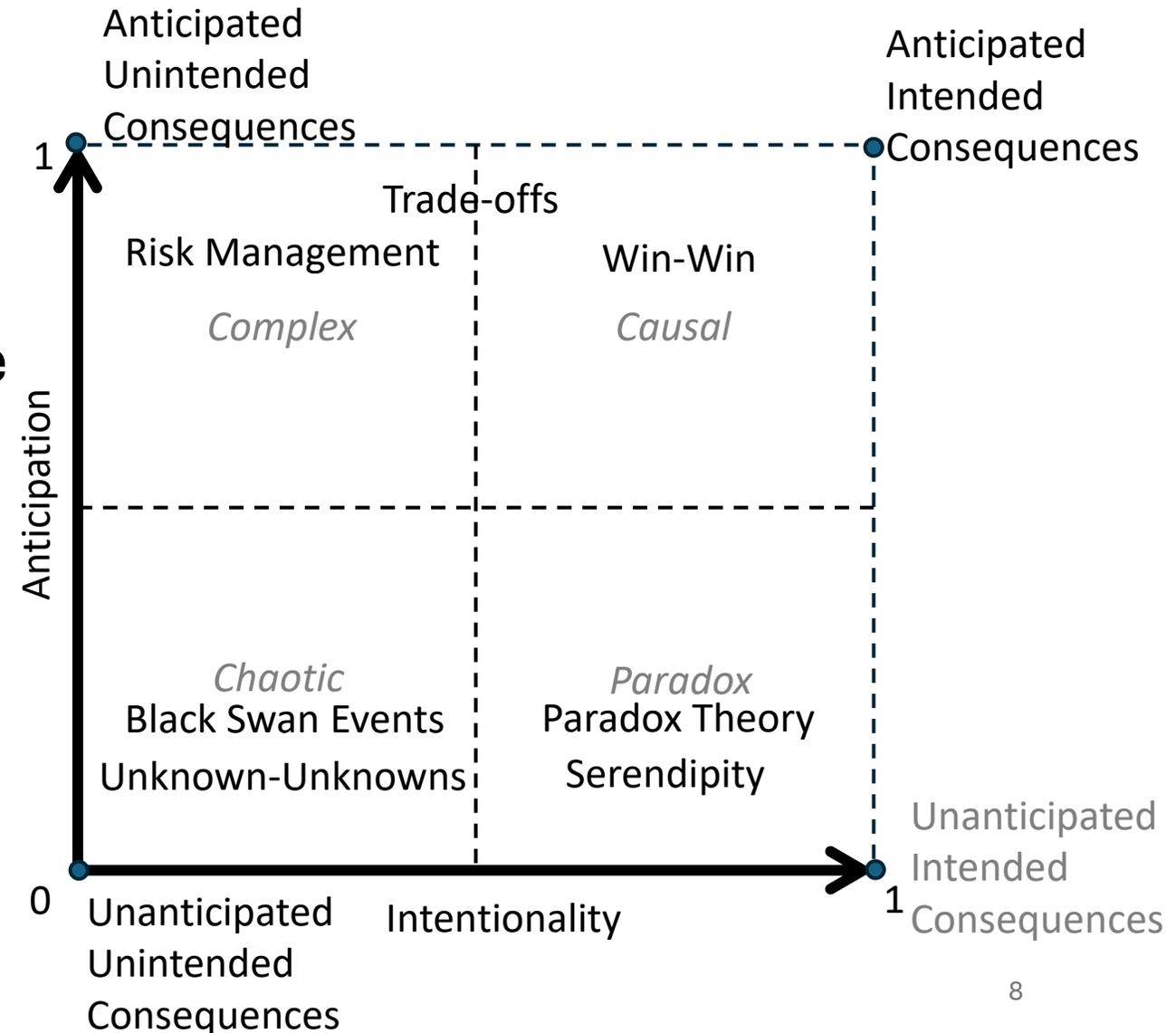
Unintended or unanticipated?

- Anticipation and intentionality are not binary states but continuous dimensions of consequences.
- **Anticipation** refers to how predictable a system is, not how probable a consequence is.
- **Intentionality** is the core purpose of a purposive action.



Conceptual framework

- Locating existing SCM tools and ideas within the framework illustrates how different consequences can be managed.



Methods

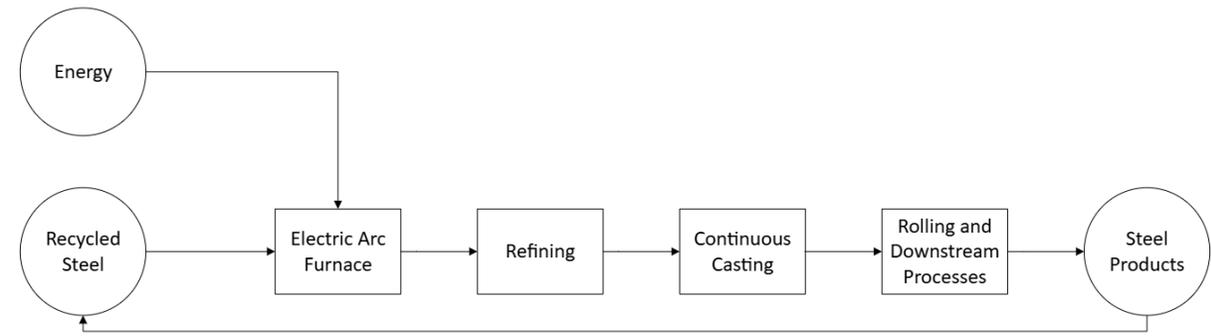
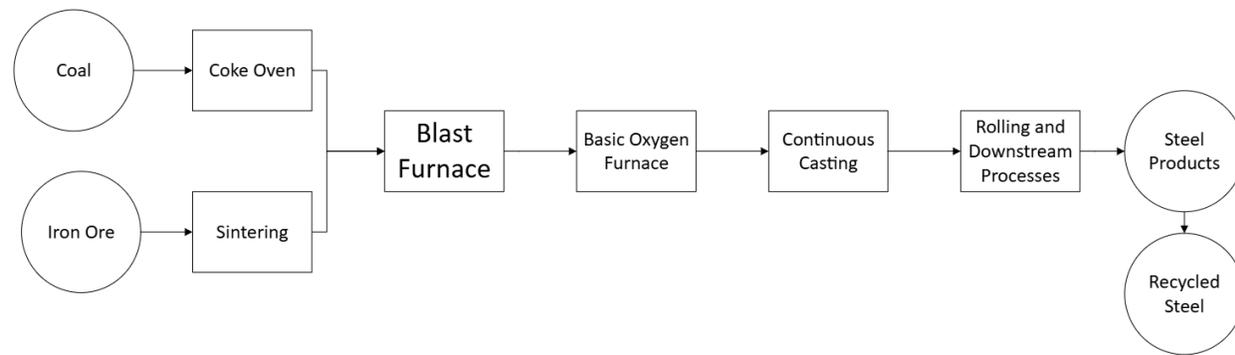
Methods

- Qualitative longitudinal research design to track case studies over time
- Iterative rounds of semi-structured interviews with broad range of stakeholders triangulated with other documents
- Focus on actions, consequences, and change over time
 - Define the action
 - Identify stated intentions
 - Trace emerging consequences over time
 - Assess anticipation and intentionality
 - Locate consequences across system levels

Case Study

On September 15th, 2023, TATA Steel, one of the world's largest steel manufacturers, announced it would replace its two existing blast furnaces in Port Talbot with a new electric arc furnace (EAF)

What was the action?



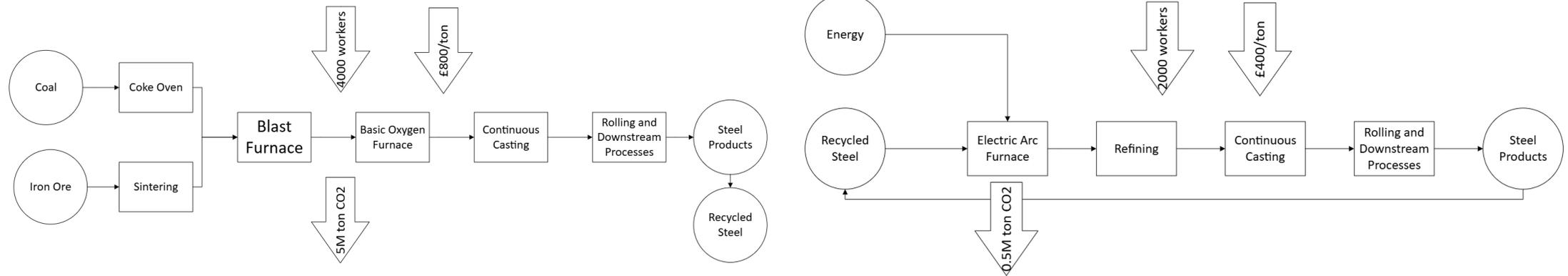
What was the intention?

1. Financial sustainability
2. Decarbonisation
3. Asset management
4. Customer demand

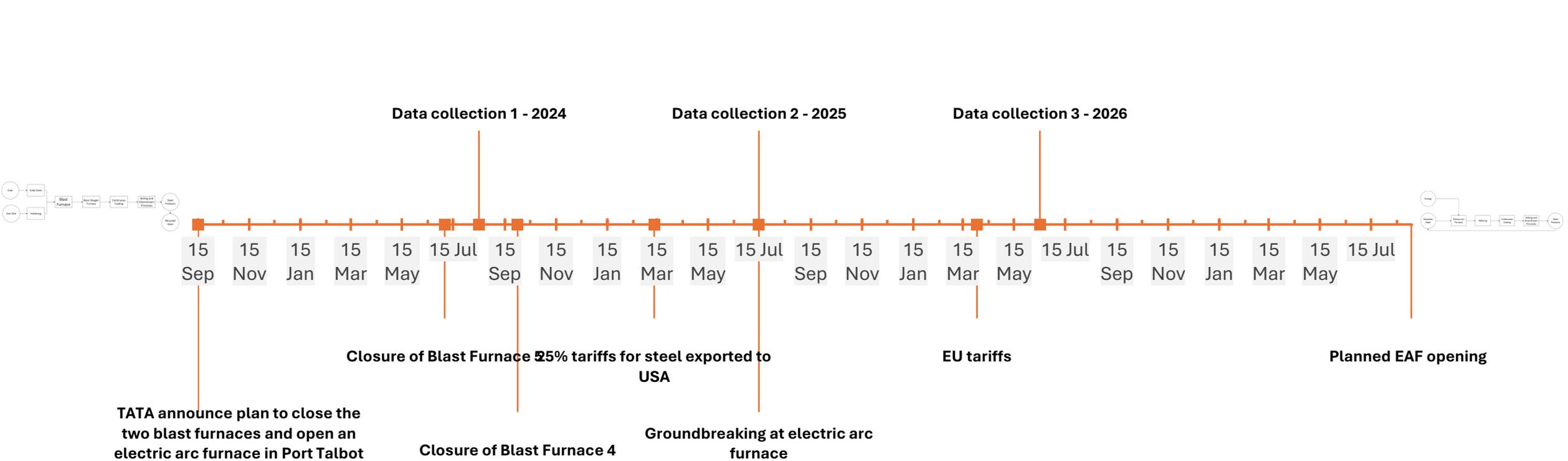
So one of the reasons is to reduce the impact of steelmaking on climate change, because of the amount of CO2 that's driven by blast furnace steelmaking.
– TATA Steel Manager

And I think since 2008 really, they've done a lot to run us down to a position where we're in the position where we are now. – Union Rep

What was the intention?



What actually happened?

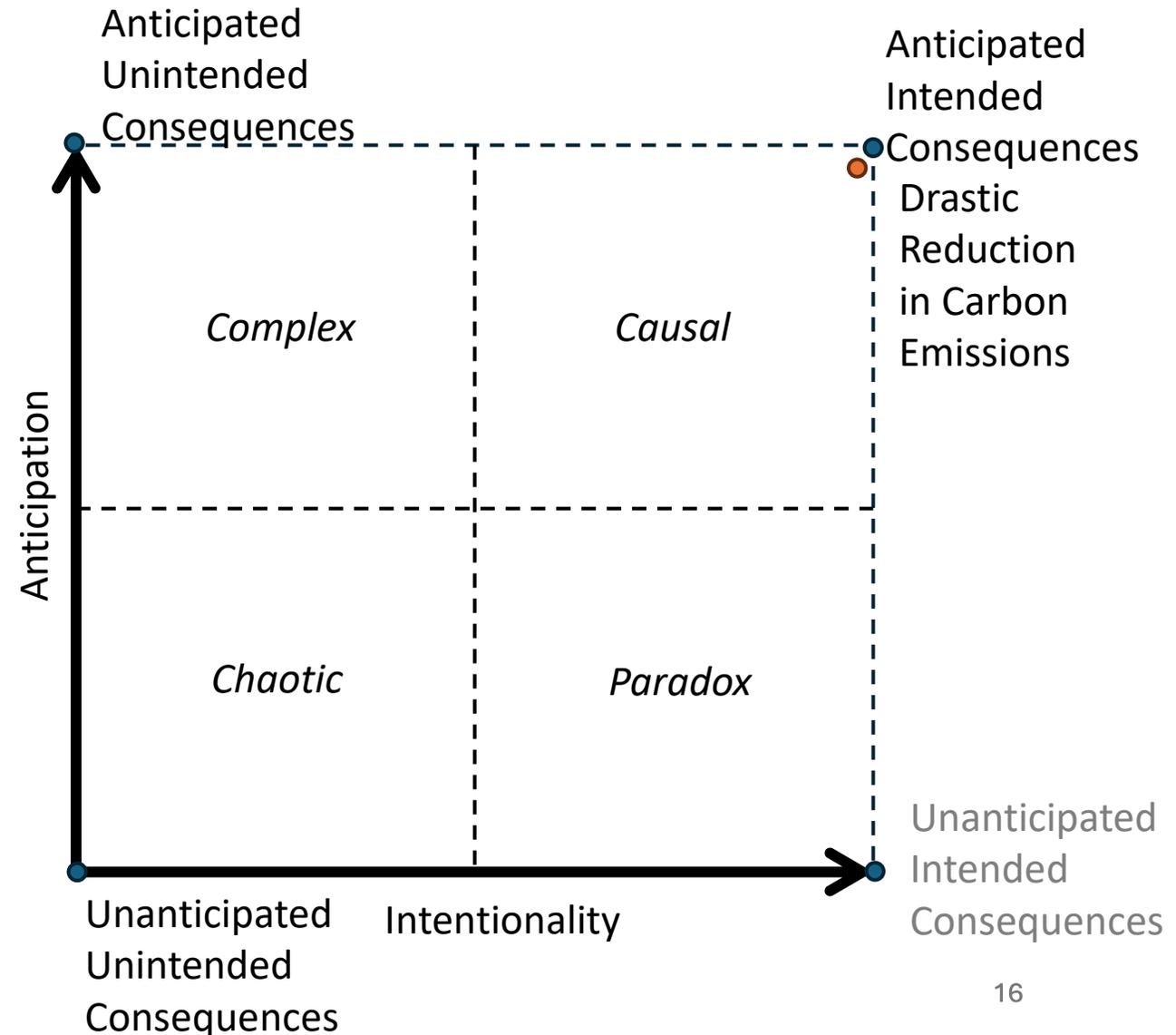


What actually happened?

Carbon Emissions

The change that we're making reduces the carbon footprint of Wales by 15%... In one project. – TATA Steel Manager

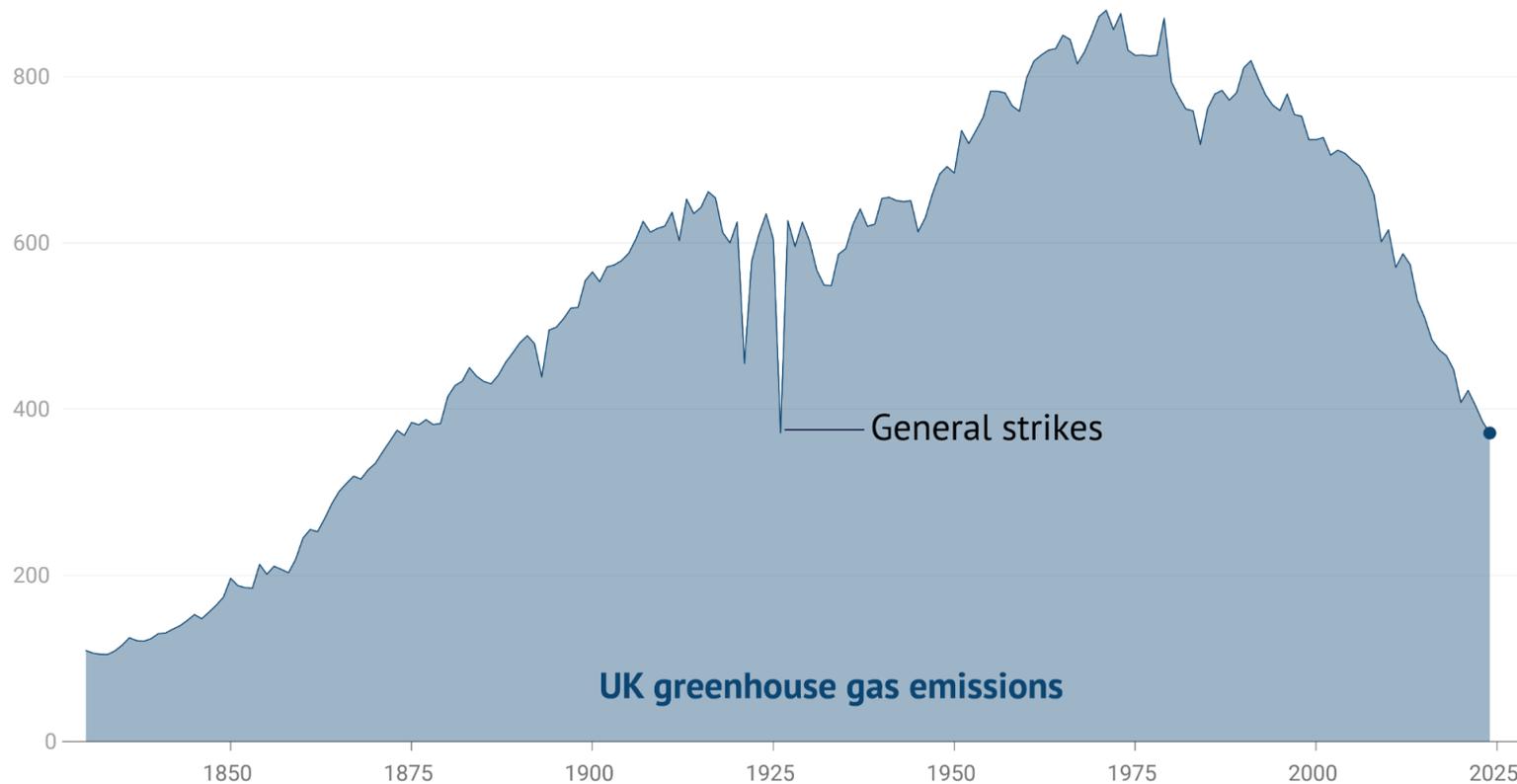
Not having a blast furnace going, you know, I think it's 85% reduction in emissions or 90%, that's going to have a major, major impact... and, you know, the air quality levels in Port Talbot were kind of quite challenging. – Welsh Government Official



What actually happened?

UK emissions fell 3.6% in 2024 to lowest level since 1872

Territorial greenhouse gas emissions, MtCO₂e



Source: Jones et al. and Carbon Brief analysis

What actually happened?



• This article is more than 1 year old

'Hypocrisy': Tata builds vast India furnace despite Port Talbot emissions claims

Owner says shutting Welsh blast furnaces will cut emissions, but it is opening a new one in India

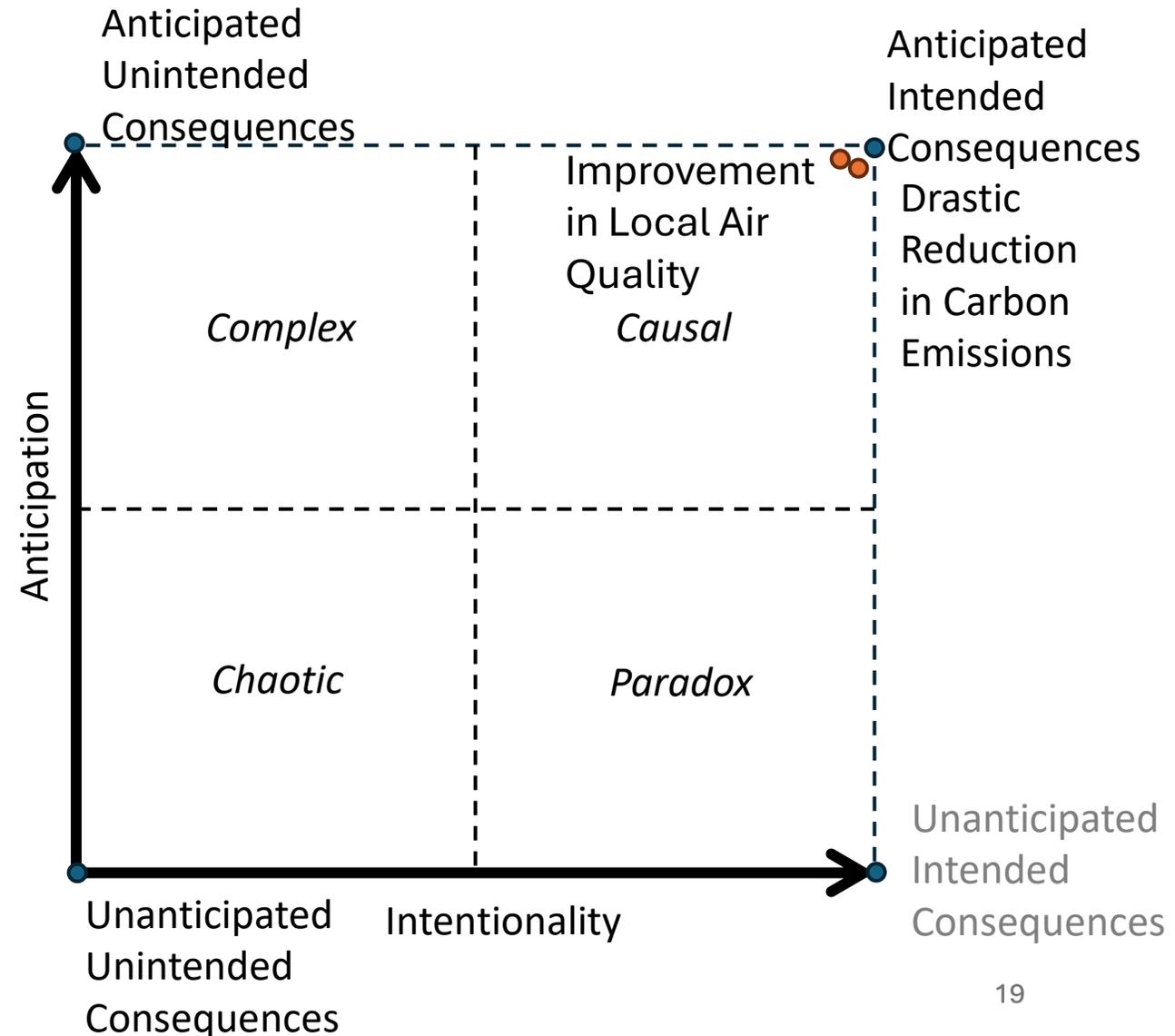


What actually happened?

Air Pollution

I spoke to a colleague who took redundancy... she was fantastic, I can go out in my back garden, sit my garden furniture without having to clean it every time, that's huge. – TATA Steel Supply Chain Manager

Literally the day they closed the blast furnace... we used to have a clean air windows every day, and we couldn't hang clothes out to dry, but now that's changed completely, and like you said the environment, or environs then, just going to the beach and stuff, is that little bit nicer? – Senedd Researcher



What actually happened?



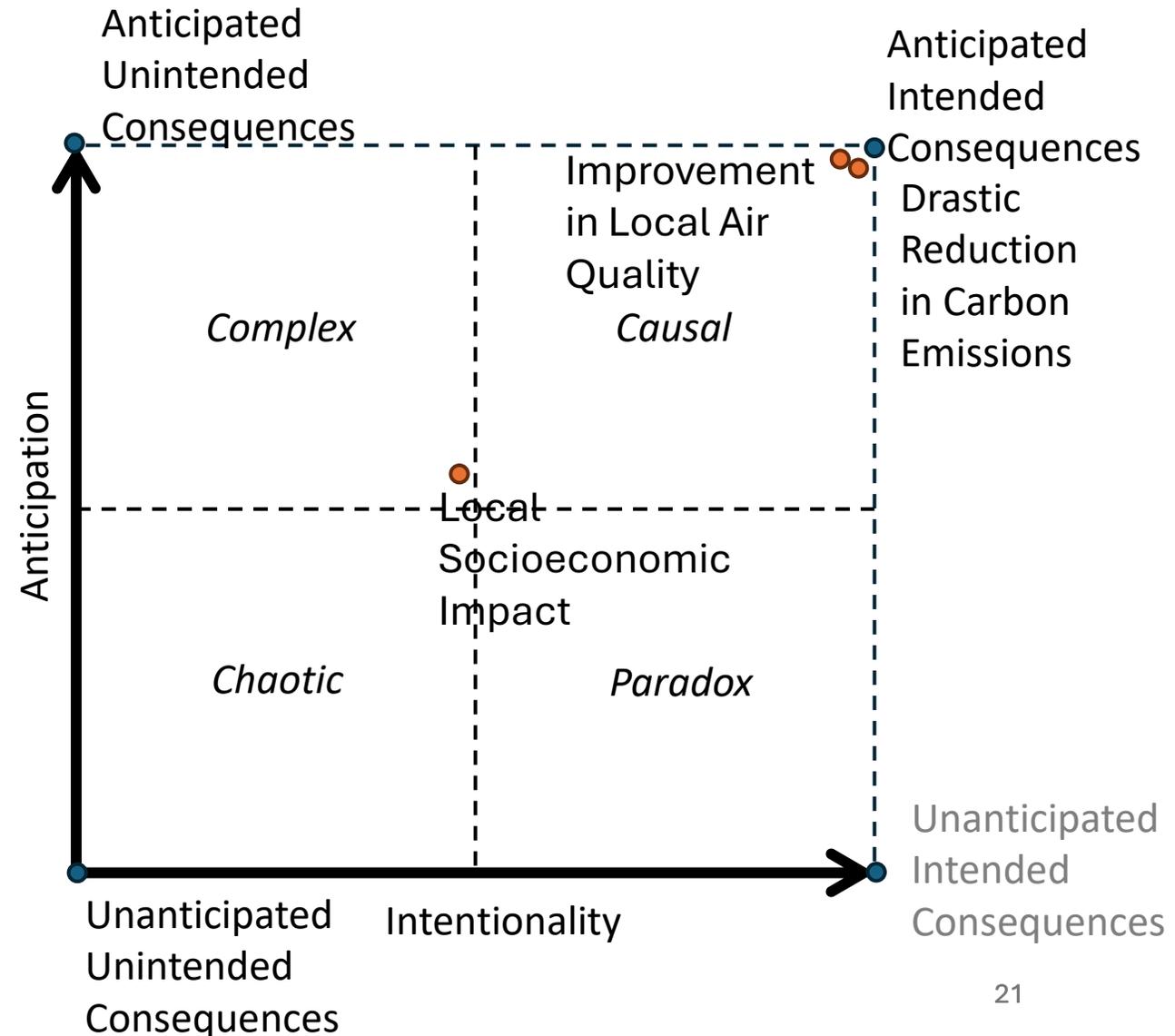
What actually happened?

Local Socioeconomic Impact

The immediate impact, economically, seems to be positive. If you're close to retirement, you've got more money in your pockets than you thought you'd have. – Union Rep

A lot of people that I know that left set up their own business, whether it be window cleaning, dog walking, they had some of that mandatory support to get them going – TATA Steel Supply Chain Manager

I think some things that other people will think unexpected, we thought was entirely predictable. So 2,000 people have gone out the door and there's no queues at the job centre... We've probably seen a growth in local business and entrepreneurialism in Port Talbot off the back of people who have taken the financial payments and have seen an opportunity to go and do something. – TATA Steel Manager



What actually happened?



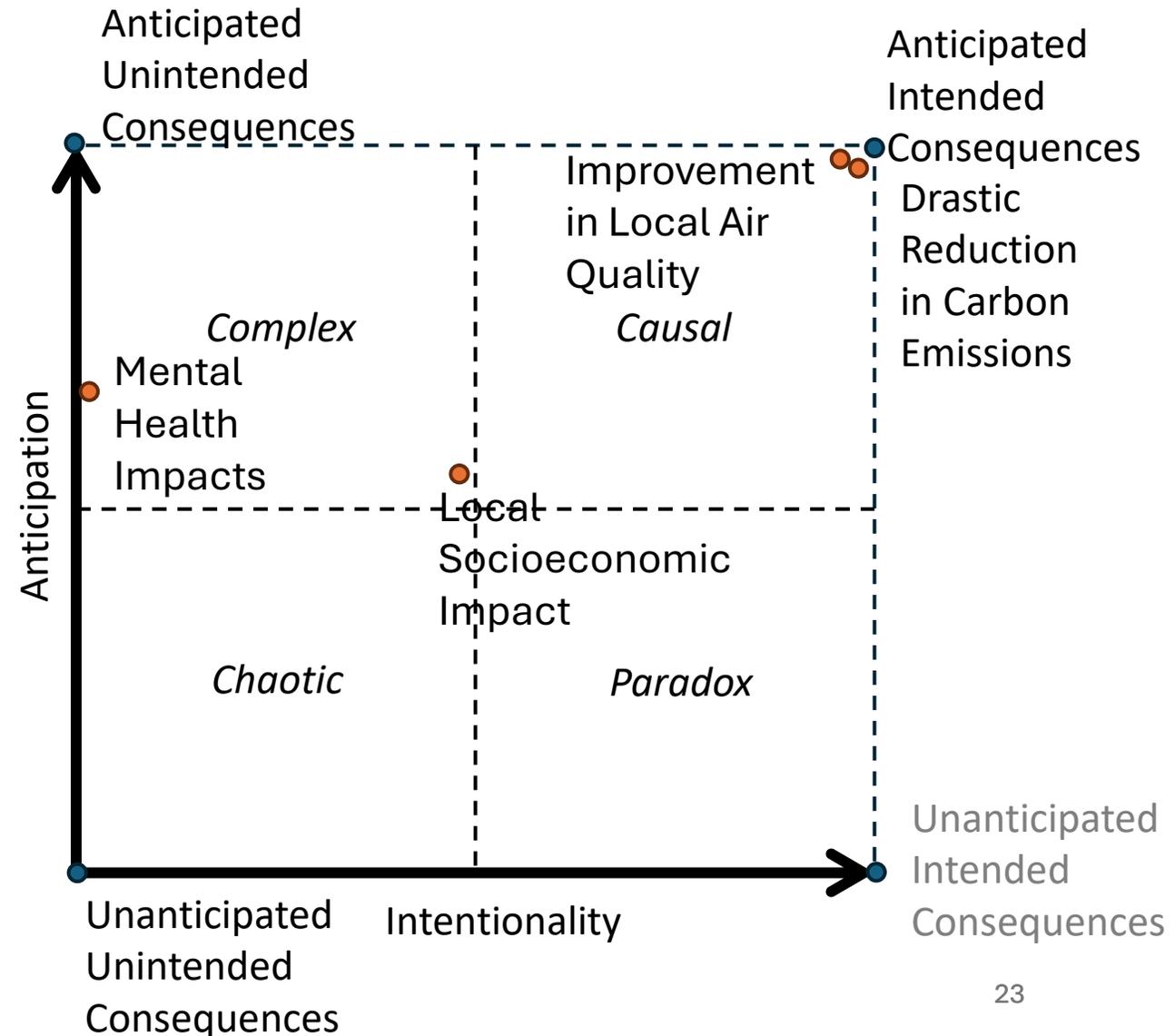
What actually happened?

Mental Health Impacts

I sat in them meetings with those people who were directly affected over the last two years and watched people cry and break down – Steelworker

There was a lot of anxiety, and people were taking things home with them... It affects everything, mental health, domestic violence, everything – Union rep

I know certainly the Transition Board has put some extra funding into supporting mental health provision in the local area – Senedd researcher



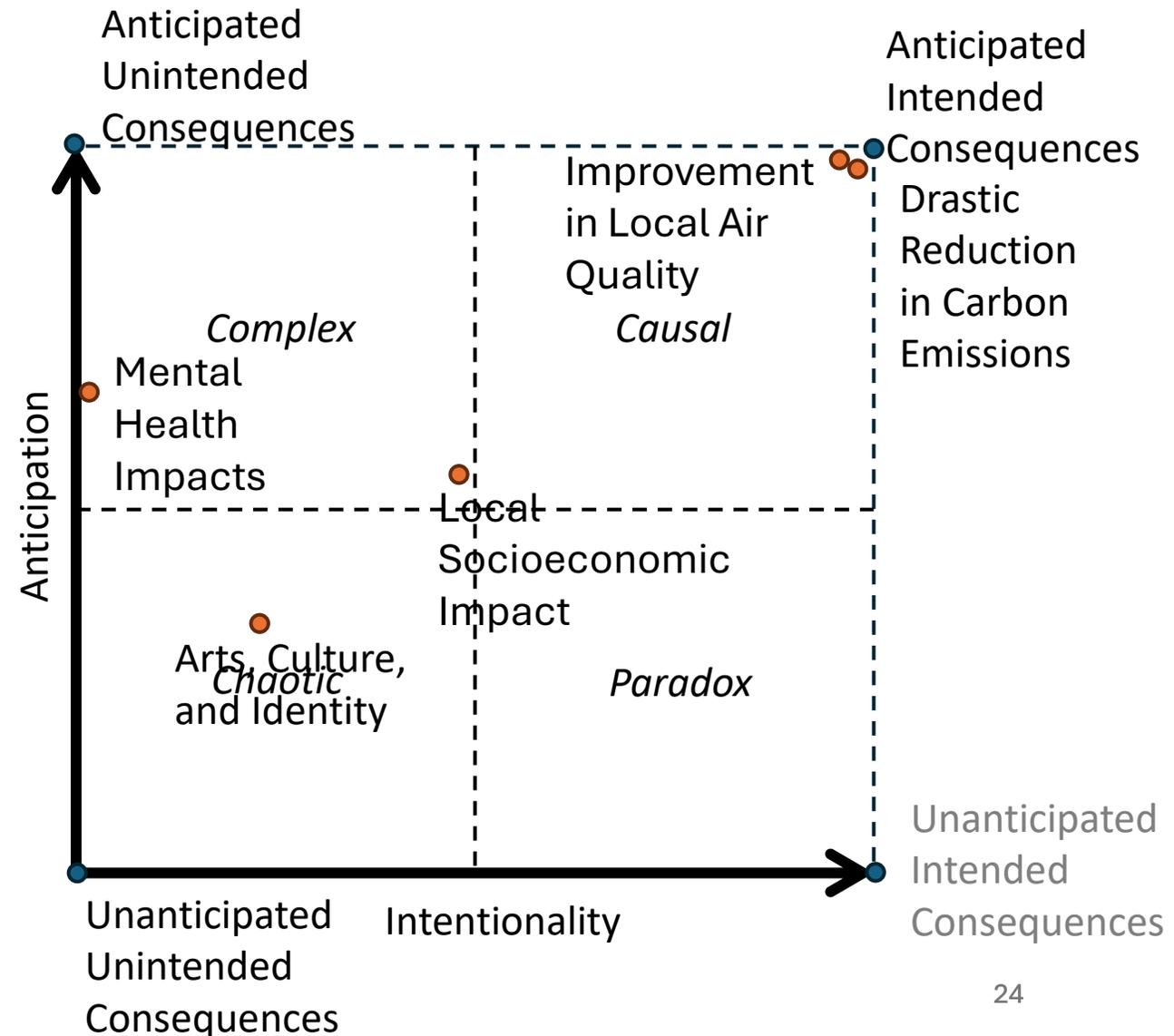
What actually happened?

Arts, Culture and Identity

Oh, we love them. Yeah, yeah. Yeah, they're iconic. And you've seen them from Aberavon Beach, right? Yeah. People say, oh, they look like the ATACs on Star Wars or something, don't they?
– Youth Leader

one of the kids want to be party in the steelworks with DJ aliens. Let's have and let's create something else, because otherwise you're going to be in the same situation... with lots of people in despair. - Youth Leader

It's always quite touching to see industrial sites with a long heritage. And the pride that workers have in what they do and the culture of mutual support – UK Climate Change Committee Member



What actually happened?



What actually happened?



Why?

Supply chains are complex adaptive systems

Many interacting agents – diverse actors or components interacting locally

Non-linear dynamics – small changes can trigger large, unexpected effects

Feedback loops – reinforcing and balancing feedback shape system behaviour

Emergence – system-level patterns arise from local interactions

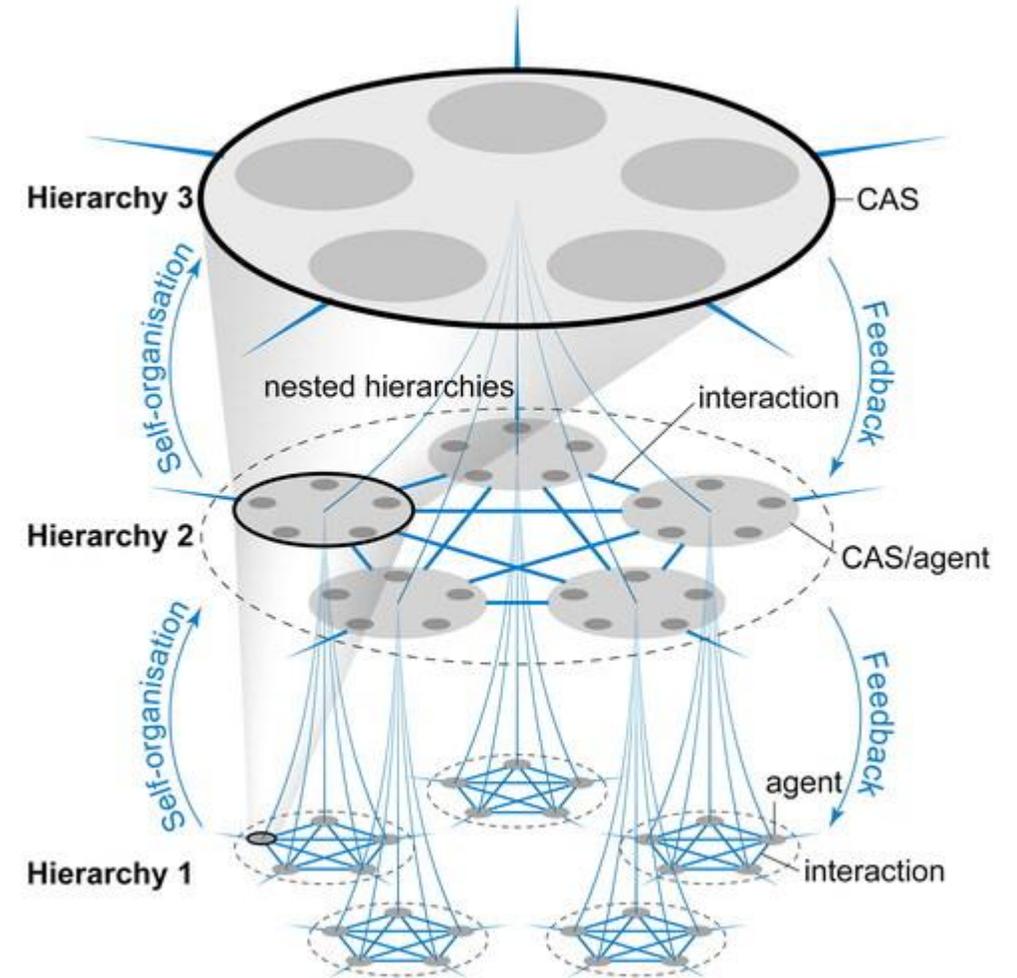
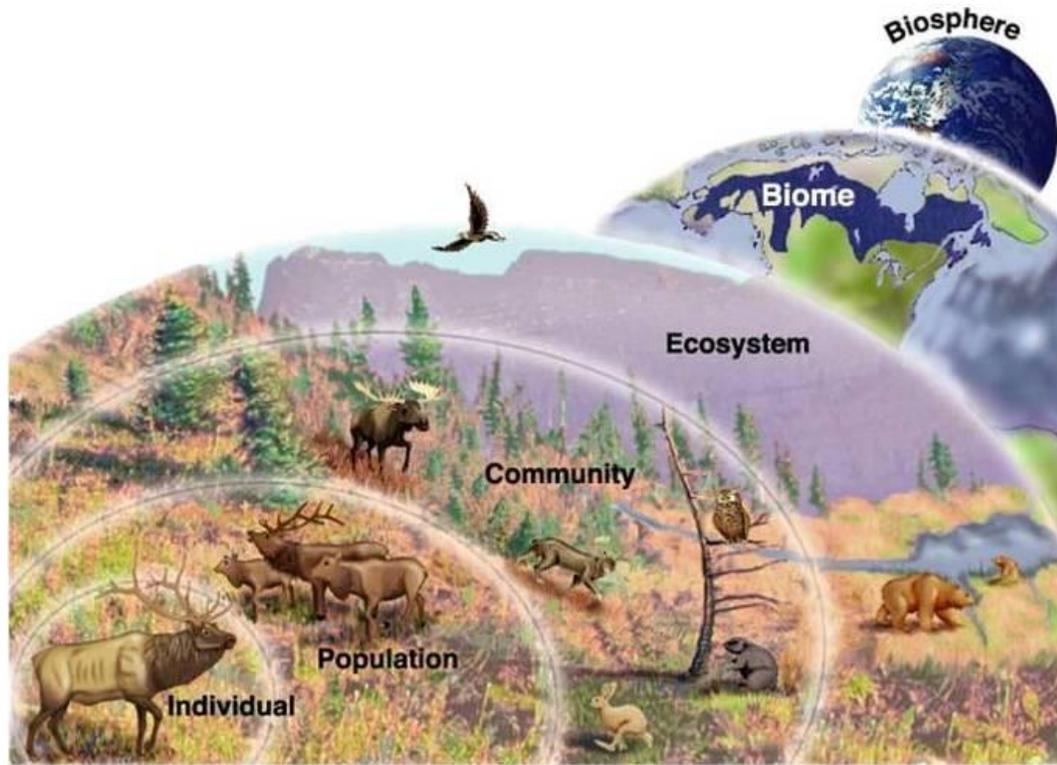
Adaptation & learning – agents adjust behaviour in response to change

Self-organisation – order can arise without central control

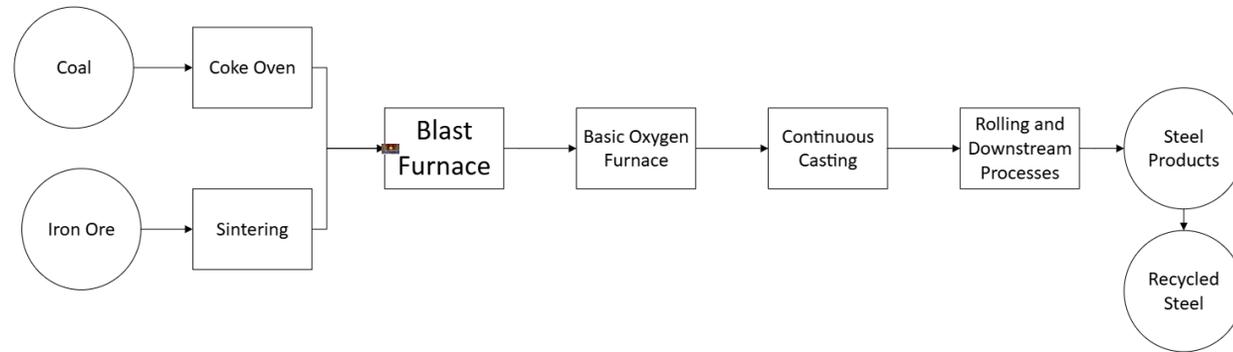
Nested / hierarchical structure (panarchy) – systems operate within interconnected layers across scales

Uncertainty & unpredictability – outcomes are difficult to forecast

Complex adaptive systems



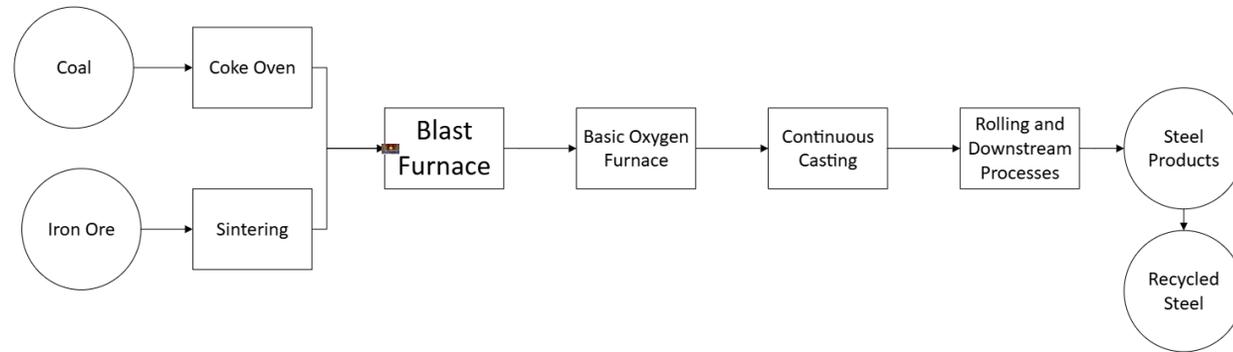
Complex adaptive systems



Complex adaptive systems



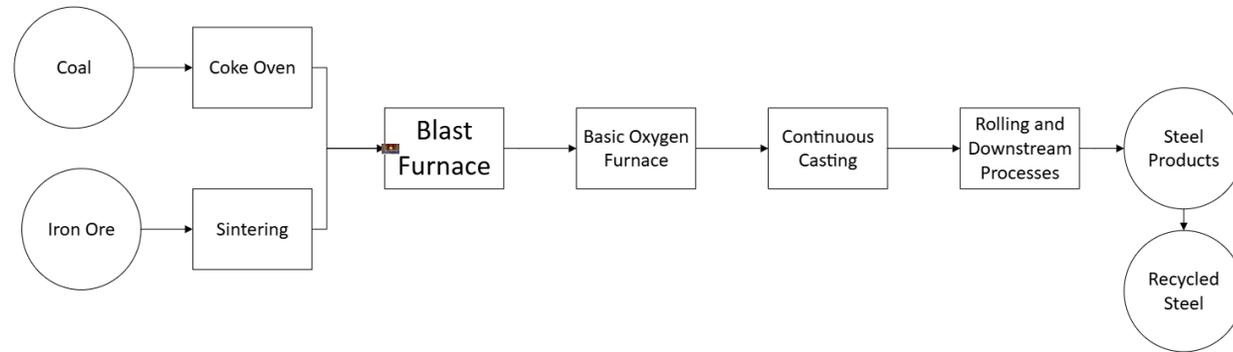
Complex adaptive systems



Complex adaptive systems



Complex adaptive systems



Conclusion

Conclusion

- Unintended consequences are inevitable in complex interacting systems such as supply chains.
- Consequences emerge at different scales, times, and locations.
- Monitoring emerging consequences over time allows the correct tools to be adopted to manage them.

Diolch!
Thank You!