SST 29 Positive Feedback and Resource Depletion

The Town That Couldn't Stop Growing

Riverton was thriving. A large technology company established its headquarters in the town and quickly attracted other businesses. New jobs appeared. House prices rose. Shops expanded. Investors arrived.

Every year seemed better than the last. The more successful the town became, the more people wanted to move there. New housing developments appeared. Roads were widened. Schools expanded.

Local government celebrated the town's growth. The future appeared bright. Yet beneath the surface, less visible changes were occurring. Traffic congestion increased. Water demand grew steadily. Housing became increasingly expensive. Infrastructure struggled to keep pace. Green spaces gradually disappeared. Many long-term residents began moving away.

These concerns were largely ignored because the town still appeared prosperous. After all, employment was high. Investment continued. Property values increased. Growth seemed to confirm that everything was working.
Then problems began to emerge rapidly. Infrastructure costs escalated. Housing shortages became severe. Businesses struggled to recruit staff because workers could no longer afford to live locally. Public services became overwhelmed. Suddenly the town that had been celebrated as a success was confronting a series of interconnected crises.
The problem was not that growth had occurred. The problem was that the very process driving success had gradually consumed many of the constraints that made success possible.

Formal Description

Positive feedback escalation occurs when reinforcing processes amplify change over time.
In reinforcing feedback systems:

- growth encourages further growth;
- success attracts additional success;
- influence generates additional influence;
- investment attracts further investment.

Such processes can produce rapid expansion and transformation.
However, reinforcing feedback does not occur in isolation.
All social systems depend upon enabling constraints such as:

- resources;
- infrastructure;
- environmental capacity;
- institutional capacity;
- human skills and expertise;
- social trust.

Resource depletion occurs when these enabling constraints are consumed faster than they are replenished or expanded.
Within the Enhanced Morphogenetic Cycle (EMC), positive feedback may initially accelerate movement toward a more attractive state. However, if balancing mechanisms fail to regulate growth, the system may gradually erode the very constraints upon which continued viability depends.
The result is hidden fragility. The system appears successful while becoming increasingly vulnerable.

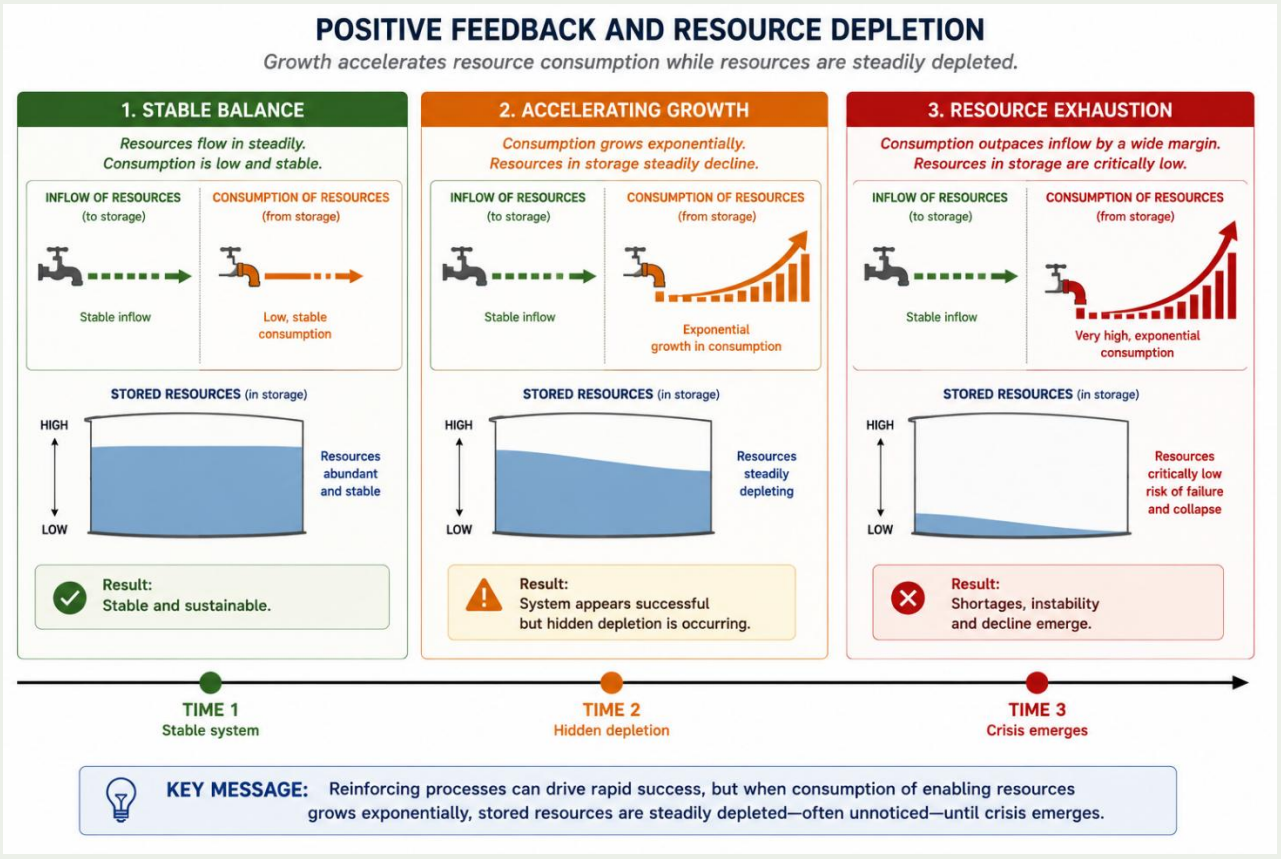
Plain English Explanation

Some of the most serious problems occur when things appear to be going well.

- Growth often creates more growth.
- Success often attracts more success.
- Popularity often attracts more popularity.

This is positive feedback.
Positive feedback is not inherently bad. In fact, many successful organisations, communities, and economies depend upon it.
The problem arises when growth consumes resources faster than they can be replaced.
For a long time this may go unnoticed. The system continues appearing successful because the accumulated resources have not yet been exhausted.

Eventually, however, shortages begin to appear. At this point the system may discover that it has been consuming the foundations of its own success.
The key diagnostic question is:
"What enabling constraints are being consumed faster than they are being replenished?"



Example 1 – Housing Bubbles
Rising property prices attract investors.
Investment increases demand.
Increasing demand pushes prices even higher.
Meanwhile affordability declines and household debt increases.
The system appears successful until underlying constraints become limiting.
Example 2 – Infrastructure Neglect
An organisation postpones maintenance to reduce costs.
Short-term financial performance improves.
Resources are directed elsewhere.
Over time infrastructure deteriorates.
The organisation appears efficient until accumulated maintenance requirements suddenly become critical.

Provenance and Links

The concepts of positive feedback and resource depletion draw upon systems theory, cybernetics, and ecological resilience theory.

Positive feedback was identified early in System Dynamics as a powerful driver of growth and change, while resilience theory highlighted the importance of maintaining enabling constraints that support long-term viability.

During the development of the Enhanced Morphogenetic Cycle it became apparent that many crises emerge not from immediate failures but from the gradual consumption of supporting constraints hidden beneath apparent success.

The module draws upon:

- Jay Forrester (System Dynamics)
- Donella Meadows (Feedback Systems)
- C. S. Holling (Resilience Theory)
- General Systems Theory

Practical Exercise – Student Response Area

Think of a system that appears successful.

Examples: an organisation; a community; a business; an industry; or an economy.

1. What reinforcing processes are contributing to its success?
2. What resources or enabling constraints support that success?
3. Are any of these constraints being consumed faster than they are being replenished?
4. What signs of hidden fragility might already be visible?
5. What balancing mechanisms could improve long-term viability?