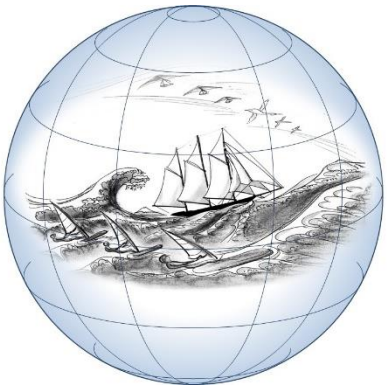


9-3

How to thrive: Resilience-III

Manchester is now one of the '100 Resilient Cities' of the Rockefeller Foundation (along with Chennai and Melbourne as sketched in ***DEVELOPMENTAL-III,*** *Fig.10-2*). Compared to other cities, there is some risk of flooding, but few major earthquakes or or cyclones or tsunamis: so maybe the greater risks are external, from pandemic flu, cyber-attack, global food insecurity, or any combination of these, all more difficult to assess.[1] Or could it be that even greater risks are internal, with endemic poverty, poor housing, ill-health and the UK 'hostile environment' for welfare and immigration? But most of these are not classified as risks, more like embedded in society, and so the official risk or resilience reports tend to leave them out.

All this raises critical questions on resilience – to what, for whom, where and when? For the international Sendai Framework, resilience is: 'The ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.'[2] But what if the *'community or society'* here is based on inequality and exploitation – should we 'preserve and restore' the existing protection for the rich and insecurity for the poor? (This question came up with the restitution funds after the great 1953 English flood). The implication is that risk and resilience is not only a technical question, but raises *wider* questions of politics, and *deeper* questions of ethics. This highlights the difference between a technical approach, which by default screens out socio-political questions, and a synergistic approach which builds them into a transformation agenda (and the catch is, it's much more challenging for policy or business or research).

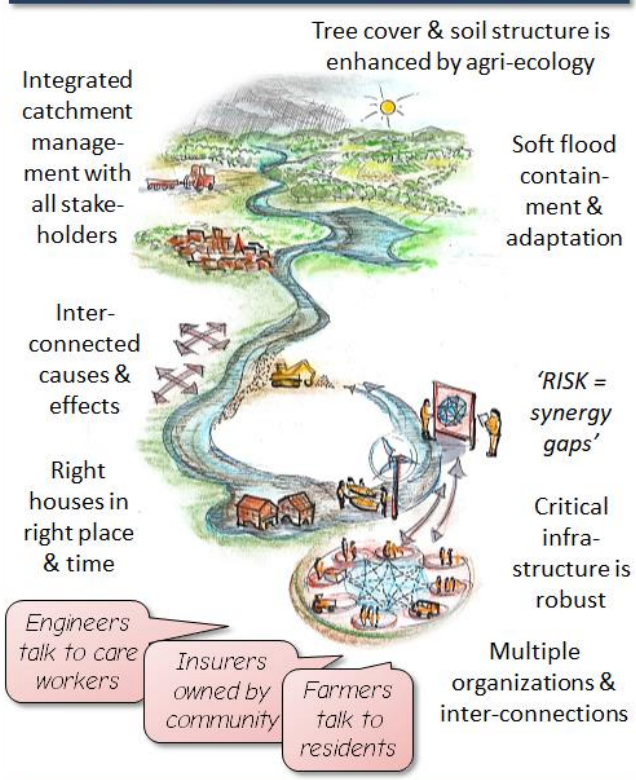
Figure 9-3

RESILIENCE–III

Exploring the co-evolution of systems resilience, with examples of flood risk & climate adaptation

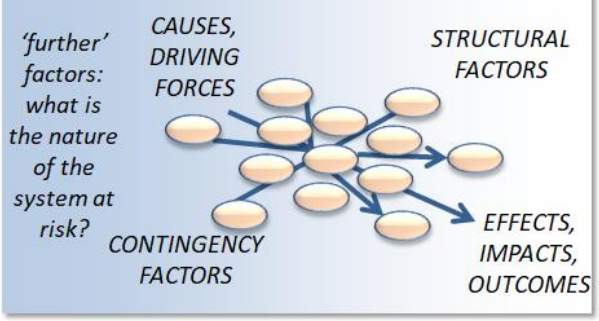
a) FUNCTIONAL RESILIENCE–I&II

b) TRANFORMATIVE RESILIENCE–III



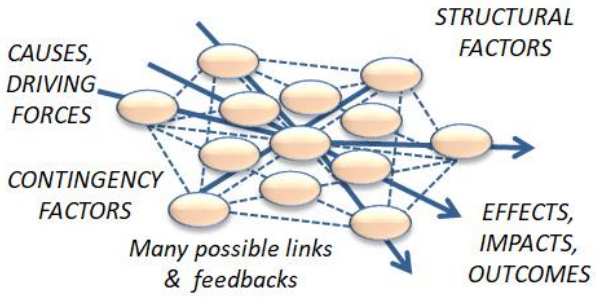
c) LINEAR RISK TREE–I&II

'Risk Tree' with basic links from upstream to downstream



d) CO-EVOLUTIONARY RISK NETWORK–III

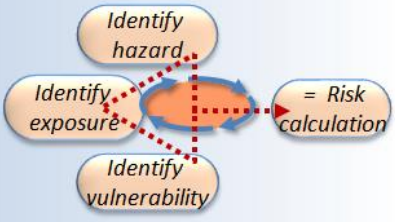
'Risk Network' or 'Constellation' with many inter-connections



e) LINEAR RISK CYCLE–I&II

Risk assessment works with components in silos

Risk assessment is a triangle to be calculated: risk = hazard x exposure x vulnerability



f) CO-EVOLUTIONARY RISK CYCLE–III

Risk evaluation works with multi-way learning & adaptation

Systemic risk combines with systemic response, adaptation & resilience

Risk in an inter-connected world

Climate change is already raising the risk levels, as storms grow stronger, houses or whole cities are built in the wrong location, and the most vulnerable lack insurance. But again it's much more than a technical problem: there are psychological attachments, economic speculations, political manipulationss, all compounding each other, in self-reinforcing feedback, amplified by mistrust and paranoia.[3] The problem is not only material (the height of a flood wall), but one of *deeper-complexity*, in how organizations learn and communicate (or not): climate change is not only a massive many-headed risk agenda, but a *deeper threat multiplier* on all the other societal risks around.

'Wider' risk model

So, let's map and visualize this *deeper-risk* agenda. Looking at the *wider* factors of the system, we see a conventional linear type risk tree, shown in ***RESILIENCE-III*** *(Fig.9-3)*, centre left ***c)***. There are storms upstream, so the river overflows, houses or businesses are flooded, where some are prepared but others are not, with damage caused to the value of 'X'. We can enquire into contingencies and details, such as the location of a blocked drain or gap in the river wall; or the context, for instance a government which isn't trusted, or organizations which can't communicate (as in the UK floods of 2007).[4] But in this risk model, these are all discreet factors, each on its own branch of the tree.

By contrast, in the centre right hand picture ***d)*** is more of a 'risk network' or 'risk constellation'. Here many more things are inter-connected, in a more complex web of cause and effect, combining material problems with human cognitive factors. Maybe the drain was blocked as an indirect result of a declining neighbourhood, white-collar corruption or public service cuts, maybe the land upstream was more prone to flash flooding due to farm subsidies. And so on, all the way up to the broad contours of capitalism with inequality and exploitation. Again, the implication is that risk is a political issue: if the poor are more vulnerable, in the wrong locations, with less resources, as cause/effect of inequality, then either (a) it's their problem, or (b) risk assessment and risk management should include for this. It seems the technical details of a drainage system are highly inter-connected with societal transformation.

Deeper and 'circulatory' risk models

We can see the *Mode-I* linear risk calculation in ***RESILIENCE-III***, lower left ***e).*** Drawing from the risk tree above, it looks at how far 'A causes B', with 'impact' and 'probability' in the triangle '*Risk = hazard x exposure x vulnerability*'.[5] Flood defence managers would insert the best available numbers, design one-off fixes for each risk, calculate the benefits over costs, and set a list of priorities for action. If the risks are more systemic, we get 'high-level' expert panels to deliberate with Delphi-type surveys and multi-criteria star ratings, which is how the National Risk Assessment

works in the UK and elsewhere. If we scale up to the global level, then the numbers tend to hang together on the statistical level, enough to fine-tune the insurance sector calculations and write the global risk reports.[6] The statistical approach can work well, until systemic change produces tipping points such as financial crisis, pandemic disease, political upheaval or climate change. In contrast, a synergistic risk approach, on the right hand ***f)***, combines with systemic response, adaptation and resilience, both material and cognitive. This *deeper* and *wider* risk assessment includes for learning, adaptation, foresight and hindsight, and the knowledge path is more about organizational change, with double or multi-loop learning.[7]

As for the *deeper-wider* question of who is involved and what is their agenda: in the *Mode-I* version the sponsors and stakeholders of this knowledge are mono-functional and short-termist, and technical flood risk and flood defence is the beginning and end of the task. In contrast, the *Mode-III* approach sees issues of distribution, equity, futurity, ethics and moral hazard as inter-connected. The stakeholders of such risk assessments are more collaborative and inclusive, and the risk assessment of 'hard' hazards and defences is also a 'risk evaluation' of 'soft' relations between organizations, communities and networks.

This is where risk/response (i.e. 'disaster risk management') morphs into resilience strategy. Again, the crucial point seems to be the inter-connections between material and human factors. A blocked drain is a material factor which can cause a material flood, but the chain of communication, maintenance programmes or working conditions are all about the human side, the cognitive capital or *deeper-complexity*. And here it seems that humans are not only rational beings who follow instructions, but also have darker sides of corruption, paranoia or speculation: the knowledge of flooding, or of financial crisis (in advance or after the event), can be a 'wild' or problematic kind of knowledge, controversial and challenging, often denied or suppressed, which then amplifies the original failure (at the time of writing the coronavirus is spreading around SE Asia, partly due to the original whistleblower doctor being silenced). Such wild cards seem to be more common than standard risk calculations suggest, easy to see with hindsight (which points to the next section on foresight).

Some mental models help to find ways through this labyrinth. One is the 'Black Swan' metaphor: if you see a black swan it's a learning event, which challenges the assumption that 'swans are large white birds'.[8] Cultural Theory helps to explore the combinations of different person types and organization types, so if a risk-averse civil servant puts up a fire regulation notice, a risk-taking entrepreneur might not respond as expected.[9] So here we can use the (somewhat notorious) 'Rumsfeld' doctrine (see also ***SCIENCE-III***, *Fig.7-6**)***:

- *Known knowns*: predictable notions of cause, effect, hazard, vulnerability and impact (other things being equal);
- *Known unknowns*: similar but with higher uncertainties and less predictable outcomes;

- *Unknown knowns*: more suited to an evolutionary and entrepreneurial situation (all other things being NOT equal). For instance, the risk of fire in buildings increases with human errors and moral hazards, with fatal incidents occurring when fire exit doors are locked.
- *Unknown unknowns*: apparent wild cards or self-fulfilling scenarios: fire risk could increase rapidly with mistrust or paranoia, which results in locked escape doors;
- (Futures thinking also flags up *'unknowable unknowables',* in the next section).

But for the '*unknown unknowns'*, effective risk management is more likely via organization learning and social psychology. Synergistic thinking looks for ways to combine the different types, from the smallest details of fire or flood technology, to the largest challenges of legal systems, organizations or cultures.

Resilience of things or thinking?

This so-called 'resilience' is the counterpart to risk and vulnerability – and again we have to ask, resilient to what, for whom, when and where, for which conditions and values?[10] Resilience is a kind of follow-on to 'sustainability', with topical cross-overs between ecological science and social science, politically problematic, but moving with the tide of complexity, emergence and transition.[11] Again, synergistic thinking seems not only useful but essential.

So, let's visualize typical river catchment, in the upper part of ***RESILIENCE-III*** *(Fig.9-3)*. On the left ***a)***, we see linear or functional style resilience, using 'hard' defences, for direct and tangible hazards and vulnerabilities. In advance of flood warnings, flood defences are raised, water gates are opened, and the system is engineered for calculated flood 'return periods' of up to 200 years. But experience shows other factors can't be ignored: there are *further* gaps where channels can't cope with urban storm-water, where farming upstream is outside the control of engineers downstream, or where houses are built in high-risk locations. And there are *deeper* factors, with silo-type government lacking coordination, under-funded infrastructure, predatory landowners or divided communities.

In contrast on the upper right in ***b)*** is a more synergistic picture. Here the full 'integrated catchment management' brings all stakeholders into collaboration, soil structure is enhanced, organizations are coordinated, multi-functional urban spaces can respond to extreme weather with 'nature-based solutions'. Overall, just as the risk is framed as 'gaps in collaboration', so the resilience is framed as a cognitive-collaborative capital, or in other words a *collective resilience intelligence*.

This calls for new concepts of resilience, beyond technical defences, looking towards the wisdom of communities and societies. It's about the *deeper-mind* capacity of communities, organizations, enterprises, markets or technologies, to learn, think, adapt, innovate and mobilize. In this the synergistic mapping helps with 'what kind of problems' we are talking about, and 'what kind of solutions' are most relevant:

- If the problem is mainly functional or technical (we just need higher flood defences), then we look for 'clever' functional or technical solutions, with *Resilience-I* thinking;
- If the problem is more about incentives and innovations, then we look for 'smart' evolutionary type systems, such as housing markets or insurance incentives, in a *Resilience-II* frame. This can work well within its boundaries, but brings up moral hazards (where insurance can encourage risk-taking), or institutional traps (where insurance pays only for restitution to original conditions), or ethical challenges (where the highest profits are in highest risk areas);
- For more human type problems, often messy, creative, inter-connected, we look for synergistic and *'wise'* solutions, in a *Resilience-III* frame. Climate resilience in Manchester combines with many other kinds – resilient building design, financial resilience to crisis, public resilience to emergencies and so on, way beyond the technical agenda.

There's an engineering image of resilience as a car suspension system. A system could be designed to 'bounce-back' after an event, as in the Sendai Framework: there's also a strong case for a 'bounce-forward', so that buildings are not rebuilt in the same hazardous designs and locations. But it seems such bounce-forward is then easily captured by the elite, as in the aftermath of the 2004 Asian tsunami, where surviving low-income residents were displaced by high-value coastal strip development.

Similar thinking comes from 'socio-ecological resilience', as defined by the *panarchy* community: 'living with change and uncertainty, diversity and multi-functionality, social learning, and inter-connected self-organization'.[12] Another angle is the debate on 'adaptive capacity' – 'the ability or potential of a system to respond ... with adjustments in both behaviour and in resources and technologies'.[13] Most studies of adaptive capacity and resilience focus on the socio-ecological system ('SES'), and then conclude with aspirations for 'policy integration and better governance' – laudable and aspirational, but raising tricky questions.[14] What if we could start with a more inter-connected 'STEEPC' ('socio-technical-economic-ecological-political-cultural') kind of system, and then build adaptive capacity of the whole not the parts?[15]

Resilience-III in practice

From experience, experts or policy-makers at town meetings would say, 'let's just talk about flooding. Poverty and deprivation is a different problem for another time'. But deprivation is clearly linked to risk or resilience, and denying it can lead to conflict. For example, a flood resilience programme in Manchester was offered at zero cost to residents but take-up was low as they had many other things on their minds.[16] From experience there are simple guidelines: pro-active participation for distributed leadership (open deliberative process), keep the experts 'on tap not on top' (as in the 'Planning for Real' method), aim for transparency but avoid controversy, and take the debate to the community wherever they are. In all this the first thing is to debate the framing of the problem and potential responses, for example with fire or flood:

- A linear risk-resilience approach says 'the risk of X is 1 in a million', and a response follows from cost-benefit calculation of the impacts and options for mitigation or defence;
- An evolutionary scheme might start with an insurance valuation of £1 million per avoided fatality, and then design a resilience trading/investment programme around that;
- For a co-evolutionary agenda: 'let's discuss the combination of risky lifestyles, building design, community cohesion and structural deprivation'. Then we design a *Resilience-III* scheme, with pathways from wild cards to planned maintenance. This looks for *further* cause-effects, *wider* communities of interest and *deeper* layers of value beyond the technical.

As ever, all three levels are needed in practice. Examples such as the Incredible Edible (***FOOD-III***, *Fig.6-5)* show how climate resilience, social enterprise, eco-innovation and grassroots democracy can all combine. We might start with a debate on flood risk and resilience (in a town built in a narrow valley prone to flooding), but this opens up questions of social exclusion, trust in government or shrinkage of public services. Meanwhile at a larger scale, coastal megacities seem to be intractable problems, with 10–20 million people in the wrong place, with the wrong infrastructure and wrong kind of government. The case of Chennai in ***DEVELOPMENTAL-III*** *(Fig.10-2)*, and many other of the 100 Resilient Cities. shows how rapid urbanization generally leads to eco-destruction and vulnerability to storm, flood and sea-level rise.[17]

Practical responses might start with technical infrastructure, governance and spatial planning. Then come the questions, on how to pay for the infrastructure, and how to do spatial planning in a free-market society. Then come larger questions on trust, corruption, legitimacy or inclusion, for governments, markets, technical and legal systems.

Table 9-3: Resilience-III

	Mode-I Linear	***Mode-II Evolutionary***	***Mode-III Co-evolutionary***
	'CLEVER': complex	***'SMART': emergent complexity***	***'WISE': deeper complexity***
WIDER: (actors & factors)	Directly affected by specific risk	Indirectly affected by strategic risk	Society-wide involvement with systemic change
FURTHER: RISK (scope & linkage)	Functional risks (hazard-exposure-vulnerability)	Strategic risks with adaptive effects	Systemic change risks with threat multipliers
FURTHER: RESILIENCE (scope & linkage)	Disaster recovery & 'bounce-back'	Disaster anticipation & elite 'bounce-forward'	Anticipatory intelligence for societal transformation
DEEPER: domains			
Social resilience	Social units	Social networks	Social intelligence
Technical resilience	Mono-functional	Multi-functional	Integrated systems
Economic resilience	Industrial production	Extractive capital	Holistic livelihoods
Environ resilience	Defence for flood etc	Insurance markets etc	Multi-function ecologies
Political resilience	Institutional structures	Power games	Political intelligence
Cultural resilience	Cultural niches	Cultural markets	Cultural civilizations

For these, direct answers may be challenging, but the deliberation and learning process has to link somehow with the technical solutions. The summary and self-assessment in *Table 9-3* puts all these together, as a guide to linking the problem frame with the most effective response – the 'mode' of resilience.

Notes

[1] Hodgson 2011
[2] UN 2015, Wenger 2017
[3] Reid & Beilin 2015
[4] Pitt 2008
[5] Crichton 1999
[6] Swiss Re 2014
[7] Argyris and Schön 1996
[8] Taleb 2007
[9] Thompson, Grendstad & Selle 1999
[10] Ravetz et al 2020
[11] Waltner-Toews; Kay & Lister 2009; Wamsler 2010
[12] Folke, Colding & Berkes 2002; Evans 2011
[13] Martens, McEvoy & Chang 2009
[14] Revi et al 2014
[15] Smit and Wandel 2006; Yohe and Tol 2002
[16] White and O'Hare 2014
[17] Rajan & Byravan 2019