

The Societal Control of Risk and Sustainability: Chronic and Acute Risk Are Different!

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The Societal Control of Risk and Sustainability: Chronic and Acute Risk Are Different!

Abstract

- In principle the management of risk is the same regardless of whether the risk is chronic (e.g. climate change) or acute (e.g. BP Deepwater Horizon) in nature: those having control should understand what could negatively impact the desired outcomes and take necessary action to ensure that the design intent is achieved. However, in practice there are major differences in how the management system works for chronic and acute threats to sustainability, with advantages and caveats for each.
- This presentation reviews the risk management process for sustainability from a management system perspective, showing how the outcomes, intermediate results and performance of those involved need to take into account the drivers, points of control and the motives of key decision makers, and why classical tools such as ISO 31000 can be very useful for chronic risk but dangerous for acute risk. Issues such as life-cycle assessment; inherent conflict and leader/follower position are also discussed.

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The Societal Control of Risk and Sustainability: Chronic and Acute Risk Are Different!

- **Overview**

- Sustainability and the nature of managing safety, health and environmental risk in the process industries
- The societal management system
- Significance of the new product introduction curve
- Difference in how acute and chronic risk are managed
- Issues and challenges in societal management of chronic risk

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The nature of managing safety, health and environmental risk in the process industries

- What kind of risks are we talking about?
 - Potential for harm to people, property, the environment, from:
 - Products
 - Processes for making, distributing, using and disposing of them
 - Other impacts on society arising from the above
 - Relationship to benefits
 - risks to whom, benefits to whom, how much, when, etc.
 - "when used as intended", potential for misuse

- Principles of green engineering*
 - Maximize resource efficiency
 - Eliminate and minimize hazards and pollution
 - Design systems holistically, using life cycle thinking

* Reduced to these three,
courtesy of *Green Chemistry and
Green Engineering: A Practical
Design Approach*, by Jiménez-
Gonzalez, G. and Constable,
D.J.C., Wiley, 2011

- Perspectives:
 - Logical aspects
 - Economic aspects
 - Ethical aspects
 - Human and sociological aspects

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The nature of managing safety, health and environmental risk in the process industries

- **Risk Management is Complex**

- For decisions on where to focus attention on risk control, decision makers need to balance expected benefits against potential harm
This applies to society at large, companies, interest groups and individuals.
- For any given issue, ideally these decisions should be made on the basis of a logical comparison of alternative courses of action and their effectiveness.
- In practice, the situation is often complex, due to interrelationships with other issues, limited resources, “known unknowns and unknown unknowns”, how the risks and benefits are perceived by those involved, and personal agendas which may be partially subconscious.
- Decisions are therefore often made on a combination of analysis and intuition, influenced by the narrative (story line) constructed in the mind of the decision maker which in turn is influenced by external narratives of other stakeholders*

* A **stakeholder** is a party (individual or group) that has an *interest* in an issue and can affect or be affected by the issue. The interest may be real or perceived.
Note: this is not the same as a *shareholder*, which refers to ownership.

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The nature of managing safety, health and environmental risk in the process industries

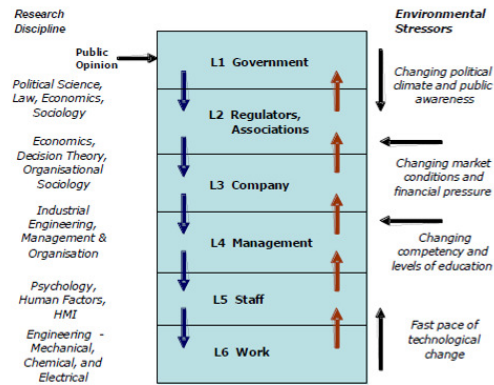
- It's usually easier to know the benefits, as those who stand to gain will provide plenty of “evidence” to support their positions – but this also needs to be assessed in context with other potential courses of action.
- Risks are more likely to be presented by those opposed to a course of action by using “scaremongering” scenarios to illustrate what has or could go wrong. These narratives are often useful for ensuring that consequences are not consciously or unconsciously overlooked, but should be considered in perspective with other information available or needed.
- Comparisons are often made in economic terms (monetary profit or loss, jobs created or lost, etc.), and even aspects that are difficult to quantify often have to be expressed in monetary terms, e.g. for budgeting, by companies and governments.
- Comparing risks and benefits is thus much more complex than it seems. Decisions on what to aspects to compare, and how much weight to assign to them, can greatly influence the results of the study.

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Societal Control of Risk

- Control of risk doesn't just depend on those "at the sharp end" – it is affected by a host of decisions by many people, in many organizations, at many levels, as in Rasmussen's diagram shown here.
- Those decisions are strongly influenced by the relative perception of risks and benefits, both from:
 - formal assessment and
 - an informal sense of potential consequences and likelihood.
- Some of this informal sense may be subconscious and not even recognized by the decision maker. It's easier to see this in acute risk, but similar issues are there in chronic risk.



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Societal Control of Risk

- Typical questions to be addressed include:
 - How is this going to be managed?
 - **Who is driving the issue?**
 - Company?
 - "The people"?
 - Thinkers in society?
 - etc. etc.
 - How does the current system of benefits & risks need to change
 - Who has control of what, and **where are the points of control?**
 - How is agreement on the changes negotiated (result is the Plan of the management system)
 - How is the plan put into effect?
 - **Who is to do what, and by when, and what results are expected**
 - **How is progress to be monitored and action taken to reconcile with stakeholder goals**

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Societal Control of Risk

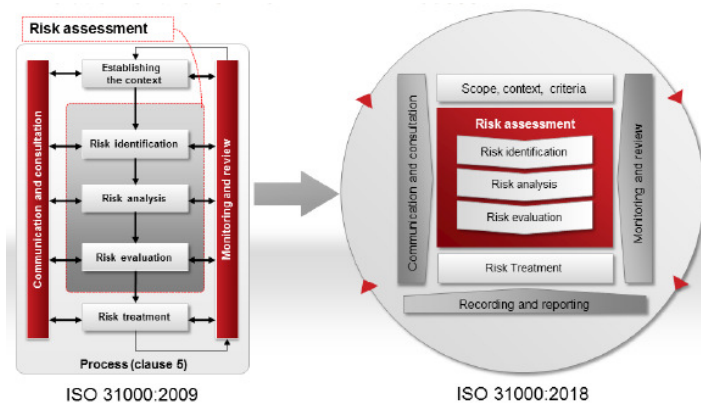
- Ideally, the control system should establish minimum standards which everyone covered should meet
- For acute risk, it is typically based on what the leaders of the regulated class are already doing (they have a much better understanding of the risks than a regulator – though their perception of risk vs. benefit could well be skewed in their favour!)
- For chronic risk, it might be based:
 - on existing good practice, or
 - on societal goals (on the assumption that techniques will be developed to allow goals to be met)
- Standards can be prescriptive and/or performance-oriented

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Societal Control of Risk

- Typically a process similar to that of ISO 31000 is used. For chronic risks it works well as status and progress can be monitored. It is not as suitable for acute risks because of the problems of monitoring residual risk and normalization of deviance.



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Societal Control of Risk

- **Who is to do what, and by when?**
 - This typically consists of codifying desirable practices in this control framework and hierarchy
 - Laws
 - Regulations
 - Codes and standards (international, national or regional)
 - Company/industry codes and standards
 - Guidelines
 - Good practice
 - Note that the actual order in which the control framework develops is often almost the reverse of the hierarchy (especially for acute risk)
 - Good practice
 - Guidelines
 - Company/industry codes and standards
 - Codes and standards (international, national or regional)
 - Laws) the order here stays the same –
 - Regulations) a law precedes a regulation
 - Time frames for implementation then need to be negotiated

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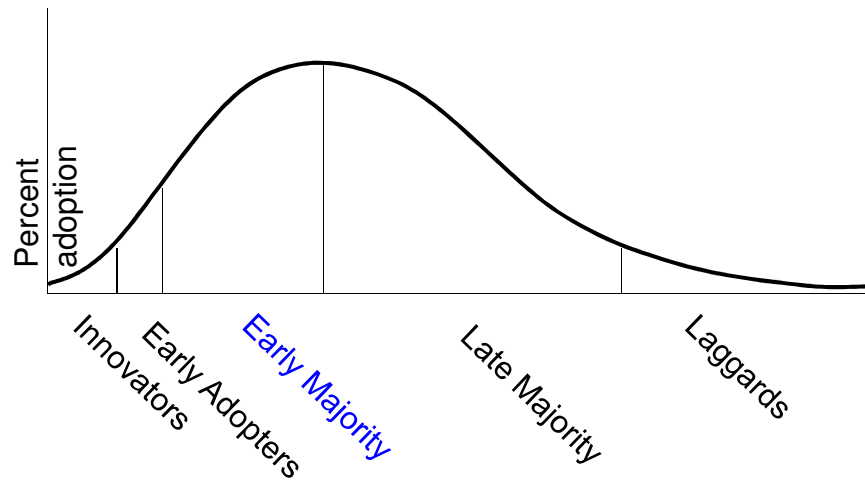
Societal Control of Risk

- Societal behaviour can be modified by:
 - Stick: e.g., penalties for failure to meet specified performance standards by a certain time
 - Carrot: e.g. tax or other financial incentives offered for research, modified production facilities, customer adoption, etc.
- Governments and companies tend to follow the new product introduction curve – leading ones innovate or rapidly adopt such measures, while others have to learn how or oppose behavioural change.
- Those that think ahead will tend to move in the direction of expected trends as they set their own plans. This costs them more initially, but gives them a strategic advantage provided conditions don't suddenly reverse
- Progress seems to be driven much more by leading examples (e.g. California state regulation) than by international negotiation, where solutions can be agreed but if political will is lacking for implementation the results may be much less than desired

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The New Product Introduction Curve



- Can be applied to adoption of new ideas, e.g. PSM
- Categories differ by ability and more importantly, motivation

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The New Product Introduction Curve

- This diagram, a concept from "Marketing 101", shows how a new product or idea is not taken up with immediate enthusiasm by the whole target market, but is adopted at different rates by different categories of users.
- **Innovators** don't need outside persuasion to get going – they are capable of moving by themselves and indeed will have developed many of the techniques described in this lecture.
- **Early adopters** are not able to develop many of the techniques by themselves, but are alert and constantly looking for ideas they can use to get their job done easier and more effectively. They read newsletters, attend conferences, research the web and often participate on technical working groups and committees.
- The **early majority** is a large group, typically with the right attitude but lacking the time or resources to learn by themselves. A combination of instruction and motivation is needed for this group, showing what tools and assistance are available and putting them in touch with innovators and early adopters who can explain and suggest to them what to do next.
- The **late majority** is also a large group, but differs from the previous group in having a much lower motivation to adopt the new practices or techniques. There may be a variety of reasons, from a well-run organization with other priorities to a poorly-run one lacking an effective process for establishing and meeting objectives. This group typically follows the early majority, doing something new mainly because everyone else is doing it, and can be brought in once the techniques, etc. have gained wide acceptance and are becoming well-known. Motivation is far more important than instruction with this group.
- **Laggards** are a smaller group, consisting of those who refuse to move unless the consequences of not doing so are close to threatening. Very strong peer pressure, the imminent cut-off by suppliers and customers or sanctions by insurers or regulatory agencies are likely to be necessary, and it is this group at whom regulations are primarily targeted.

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Relevance of the curve for strategy when introducing a change or new idea

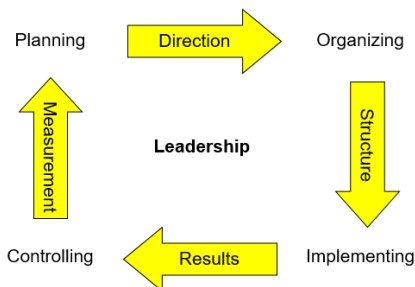
- When trying to change behaviour, don't worry about the large number and lack of enthusiasm of the late majority. **Concentrate on the early majority**, and use the innovators and early adopters to show them the way. Deal with laggards only if you need to make an example at this stage, or if behaviour is clearly unacceptable.
- Once you have worked out the problems with the early majority and have their "buy-in", then you can look for group commitment to bring in the late majority.
- As the late majority move, you can then think about graduated options to deal with laggards.

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Management System

- Functions of a management system



- Roles and Focus:

- **Executives do the right things**
business direction, policy, strategy, broad goals
- **Managers do things right**
assignment of resources, performance objectives, monitoring progress, corrective action

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Management System

- The most important point about a management system is the [feedback loop](#) to ensure that the following are acceptably consistent with the design intent (= the plan):
 - **Performance** of people (*Equipment performance is also covered here, but typically depends on the people operating and maintaining it*) and that performance is producing:
 - **Results** (e.g. output for resources used – can often be measured)
 - **Outcomes** (more related to long-term goals – may or may not be measured in quantitative terms, depending on nature)
- Note that the Plan step of a management system approaches these in reverse order: the eventual outcomes desired, the intermediate results that will lead to those outcomes, and then the performance of people (*who is to do what and by when*) to achieve those results

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Societal Control of Risk

- **Control of risk is never the main goal.** It is always subsidiary to achieving the desired benefit of change.
- Similar to sport, it involves offensive and defensive aspects:
 - Offence**
How to bring about what you **intend** to happen
e.g. expand output of substance x, reduce cost, reduce by-product formation or waste, improve energy efficiency, etc.
Much of the control of chronic risk (via Green Chemistry & Engineering) fits here
 - Defence**
How to prevent and be ready for what you **don't intend** to happen
e.g. loss of containment, explosions, fires, spills, injuries, damage to surroundings, bad publicity, etc.
Most of the control of acute risk (via Process Safety Management) fits here, but also the Law of Unintended Consequences re chronic risk
- These two aspects involve somewhat different but related approaches to the understanding and control of risk. Both involve understanding what could go wrong and acting to keep it within acceptable limits, but application of the principles to the management system is different

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Managing Risk and Sustainability

- With **acute risk** it is easier to get agreement on the desired outcomes (e.g. "Don't have accidents!"). The challenge is in understanding what to do but also – and often more difficult – defending against normalization of deviance when trying to manage something that usually isn't there.
- With **chronic risk** issues like climate change, energy, etc. the situation is developing gradually but with periodic events that lead to raising or lowering of the profile of the issue and the sense that "something should be done"
- Funds are allocated for study of causes, alternative solutions, etc. and political processes move towards negotiated plans for action.
- That movement is not steady, but subject to ongoing changes in priorities and power among the various stakeholders, who tend to select information to support their particular position
- These changes are driven by emotions as well as logic, and influenced by relative trust of issue leaders and "experts" as few have the time or ability to understand all the implications themselves
- "Experts" may claim that the evidence is "scientific", but this is not as clear as it might seem. With some chronic risk issues it is much more difficult to link consequences and causes than with acute risk.

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Managing Risk and Sustainability

- Ideally, comparing alternative courses of action should be done using life-cycle assessment (LCA) of economic and social costs and benefits, but in practice this is possible only on a limited scale. This is why the intended application, reasons for carrying out the study and the intended audience must be clearly defined at the outset of any LCA
- The scope and boundaries of an LCA can also influence the conclusions, and can result in actions that **could fail to achieve the desired intent or even make the situation worse!**
Example: conversion of buildings to natural gas heating, with investment in infrastructure that could become obsolete if electricity becomes the preferred energy source
- The broader the scope of assessment, the more the likelihood of inherent conflicts which involve issues of philosophy (e.g., should the views of one group, class, nation, etc. be given greater weight over others in a decision, and if so, how much?)

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Managing Risk and Sustainability

- Societal change can be easier to achieve where the points of control are few and concentrated and the time frame to results is short, but becomes more challenging as these increase:
 - Ozone depletion
Few points of control, short time frame
 - Acid rain, plastic waste
Many points of control in limited sectors, but in different jurisdictions, medium time frame
 - Climate change
Many points of control in diverse sectors, with multiple jurisdictions, strong competing interests; different perspectives and time frames make it difficult to reach agreement on policy, direction and focus

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Managing Risk and Sustainability

- **Leader or Follower?**
 - Both companies and regulators must also decide to what extent they want to be a leader or follower on an issue (where they want to be on the New Product Introduction Curve)
 - **Leaders** (business and govt.) drive change and can set the standard that others eventually follow. This can give competitive advantages (e.g. being the leader in new technology) but requires continuing political will and resources to overcome problems in design and implementation
 - **Followers** have far less work to do and relative costs of compliance are much less as the methods, technology, etc. are already known
 - Caveats:
 - “Yes, Minister”, the Precautionary Principle and NIMTO
 - The Bandwagon effect
 - Foot dragging, or valid caution?

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Managing Risk and Sustainability

Barriers to Action

- Even well-motivated organizations often delay action despite strong societal pressure for it, and for sound reasons
- They have to balance need (benefits) vs cost, and also assess the likelihood & rate of change of the situation.
- An example of acute risk is the contrast between safety and security:
 - Safety (standard always increasing, so if going to have to do it anyway, might as well act now)
 - Security (standard rises and falls with threat level, so might never need max defences; instead, plan to be ready, but delay until needed)

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Managing Risk and Sustainability

Barriers to Action (continued)

- With chronic risk issues, the economic aspects are very important:
- Even when a govt. offers strong incentives for action on issues like climate change, that support can change, sometimes overnight!
- This can have major effects on the cash flow and breakeven analysis, especially for capital-intensive projects such as a major chemical plant, or R & D to develop a new pharmaceutical.

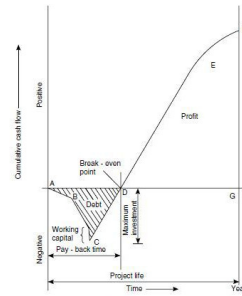
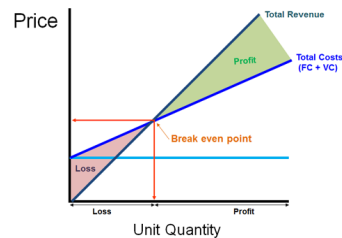


Figure 6.8. Project cash-flow diagram



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In Conclusion

- With acute risk
 - Agreement on the *Plan* step tends to be easy (don't have accidents)
 - Challenge is in effective and continuing control of NOD to restrain drift into failure, as monitoring status is difficult
- With sustainability and chronic risk
 - Depends on complexity: link between causes and consequences, and points of control in society
 - Challenge is often in reaching societal agreement among stakeholders on *Plan* step, due to limitations of life-cycle assessment, stakeholders' different perspectives on benefits and costs of remedial action
 - Progress often led more by leaders who act than from collective negotiation of agreements.
 - Once plans are agreed, monitoring status and progress is relatively easy and remedial actions can be applied where needed

Questions?