

Preface

Forty years ago, Dr. Chauncey Starr, in a seminal paper entitled “Social benefits versus technological risk”¹ asked the question: “How safe is safe enough?” This provided a powerful impetus to the academy and several disciplines developed methods to answer the related question: “What is an acceptable level of risk?” The multidisciplinary field of research that we now recognize as risk analysis was born with important contributions ranging from the social sciences (psychology, anthropology, political science) to the life sciences (biology, health effects, epidemiology) to engineering, actuarial, and management sciences. Four decades on, in this book, we believe we have a clear and consistent answer to the question of acceptable risk. In the engineering of decisions to enhance life safety and quality of life, safe enough can be determined on the basis of the societal capacity to commit resources where it will do the most good.

This book is about making decisions to manage risks to life safety, health, and the environment. Recognizing that the societal capacity to commit resources (SCCR) is limited, these decisions should be consistent with a desire to enhance life quality. Although this capacity varies from one country to another, the approach we have developed has universal applicability. The focus is not on risks as such – however colorful, dreadful, or emotionally compelling they may be – but on what can be done about the risk with available resources. The primary goal is to improve life quality. We provide a foundation and a theoretical basis for managing risk to an acceptable level under the real-world constraint of limited resources.

Enhancing life quality for all does not necessarily translate into a state of “unbounded” levels of individual well-being. Such a goal would be unattainable since the societal capacity to commit resources is bounded by the time in good health available for the working population to create the required wealth. We provide an innovative and a unique approach to supplant the evolving techniques and methods for managing risk that “balances life safety with economy” – to maximize life years in good health.

The public increasingly demands a fully transparent and open process for making decisions about life safety and its impacts on the public purse. Accountability for utilizing society’s resources wisely requires that *risks* associated with the operation and design of the public infrastructure and facilities be reduced commensurate with *benefits*. Our principal focus is on developing guidance for standard practice that is rational and meets the requirement of utilizing resources to achieve the maximum net overall benefit to society. We advance the concept of the societal capacity to commit resources as a constraint in the decision-making process.

For decision-making – we emphasize a few basic principles and requirements to serve the broader public interest, namely:

¹ C. Starr, 1969, “Social benefits versus technological risk,” *Science* 165:1232–1238

- *Comprehensive evaluation* of options and alternatives
- *Transparent and open process(es)*, iterative as necessary
- *Defensible outcome(s)*, defined as positive net benefit to society

A particular risk can always be reduced – at a cost. Safety (real or imagined) can always be improved, at a cost. All too often, ad hoc practices and demands for zero risk translate into misallocation of resources. Conversely, many risk-reducing bargains are missed because their cost is not assessed by proper comparison. We believe that improving decision processes, and optimizing engineering and safety practices to yield maximum benefit to society is the key ingredient required to better inform the professional judgment in this area.

In this book we provide managers, engineers, regulators, and decision-makers with a powerful tool to help define the reasonable trade-off between safety and economy. The fundamental principle is akin to the labor theory of value: everything of material value to humans is produced entirely by work that consumes human life time. This includes labor, of course, but also the tools of production, the capital. We express it as the *time principle*: In terms of human life time, any risk mitigation should cost less than the net time it delivers as life in good health. This principle defines the society's capacity to commit resources to the mitigation of public risk. The issue is part of what we mean by human welfare, and a precise monetary value of risk reduction can be calculated from welfare economics and econometric data for any society. We show all the details through illustrative examples.

Today many public risks can be known in great detail, including the costs of the various options for mitigation. It is imperative to clarify the principles that should apply to decisions about life safety and health of the public. These principles should guide the political process and the technology that governs safety in our society. This book presents a rational procedure to assess public risks on a universal yardstick such that the outcome is in the public interest.

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Acknowledgments

The authors gratefully acknowledge the contributions of many persons who over the years have helped in the creation and development of this work. Among them are Dr. Ernest Siddall whose inquiry into the essence of societal development gave impetus to the LQI formulation, Andreas Lind who gave critical discussion of the underlying time principle philosophy, and Professor John Shortreed, long-time director of the Institute for Risk Research.

We owe a debt of gratitude to past and present colleagues who have provided support and contributed to the evolution of our thinking on this subject: Amir Shalaby, Steve Dorey, Geoff Ogram, Keith Weaver, Dan Krewski, Lorraine Craig, Michael Faber, Rüdiger Rackwitz, Ove Ditlevsen, Michael Faber, Jay Nathwani, Marc Maes, Jan van Noortwijk, Pieter van Gelder, Hans van der Weide, Hanping Hong, and Alok Mishra. Paula and Maya Nathwani's help in shaping the title of this book is greatly appreciated. Special thanks are due to Benny Chu and Iris Strickler who painstakingly adapted the manuscript to the publisher's format with grace and efficiency.

Prof. Pandey wishes to acknowledge the support provided by the Natural Sciences and Engineering Research Council of Canada (NSERC) and the University Network of Excellence in Nuclear Engineering (UNENE) through an Industrial Research Chair Program. Prof. Nathwani, who holds the Ontario Research Chair in Public Policy for Sustainable Energy Management, acknowledges the contribution made by the Province of Ontario. The Research Chair was endowed by a grant from the Ontario Ministry of Training, Colleges and Universities administered by the Council of Universities.

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October 2009, Waterloo, ON Canada

Engineering Decisions for Life Quality

How Safe is Safe Enough?

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2009, XVII, 189 p., Hardcover

ISBN: 978-1-84882-601-4