CAMBRIDGE

Cambridge University Press
978-1-107-16188-7 — Improving Homeland Security Decisions
Edited by Ali E. Abbas , Milind Tambe , Detlof von Winterfeldt
Frontmatter
More Information

Improving Homeland Security Decisions

What are the risks of terrorism and what are their consequences and economic impacts? Are we safer from terrorism today than before 9/11? Does the government spend our homeland security funds well? These questions motivated a 14-year research program of the National Center for Risk and Economic Analysis of Terrorism Events (CREATE) at the University of Southern California, funded by the Department of Homeland Security. This book showcases some of the most important results of this research and offers key insights on how to address the most important security problems of our time.

Written for homeland security researchers and practitioners, this book covers a wide range of methodologies and real-world examples of how to reduce terrorism risks, increase the efficient use of homeland security resources, and thereby make better decisions overall.

Ali E. Abbas is Professor of Industrial and Systems Engineering and Professor of Public Policy and Management at the University of Southern California. He also serves as the director of the Center for Interdisciplinary Decisions and Ethics (DECIDE). His research interests focus on all aspects of decision making under uncertainty broadly defined. He is the author of two books and two edited volumes, and has more than 100 refereed publications. He has organized numerous workshops on decision making in large-scale systems with NASA Langley, the Transportation Security Administration (TSA), the Department of Homeland Security, and the National Science Foundation.

Milind Tambe is Professor of Computer Science and Professor of Industrial and Systems Engineering at the University of Southern California. He is a founding co-director of the USC Center on Artificial Intelligence in Society. Among his pioneering contributions in Artificial Intelligence is the security games framework that has been deployed by agencies such as the U.S. Coast Guard, Federal Air Marshals Service, and various nongovernmental organizations, for which he has received several commendations. He is a fellow of the Association for Advancement of Artificial Intelligence (AAAI) and the Association for Computing Machinery (ACM).

Detlof von Winterfeldt is Professor of Industrial and Systems Engineering and Professor of Public Policy and Management at the University of Southern California. His research interests are in the foundation and practice of decision and risk analysis. In 2004, he cofounded the National Center for Risk and Economic Analysis of Terrorism Events (CREATE) and serves as its current director. He is the author of two books, three edited volumes, and more than 100 refereed articles and chapters. He is a fellow of the Institute for Operations Research and the Management Sciences (INFORMS) and of the Society for Risk Analysis.

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-16188-7 — Improving Homeland Security Decisions
Edited by Ali E. Abbas , Milind Tambe , Detlof von Winterfeldt
Frontmatter
More Information

Improving Homeland Security Decisions

Edited by

ALI E. ABBAS

University of Southern California, Los Angeles

MILIND TAMBE

University of Southern California, Los Angeles

DETLOF VON WINTERFELDT

University of Southern California, Los Angeles

CAMBRIDGE
UNIVERSITY PRESS

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

4843/24, 2nd Floor, Ansari Road, Daryaganj, Delhi – 110002, India

79 Anson Road, #06-04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning, and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781107161887
DOI: 10.1017/9781316676714

© Cambridge University Press 2017

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 2017

Printed in the United Kingdom by Clays Ltd.

A catalogue record for this publication is available from the British Library.

Library of Congress Cataloging-in-Publication Data
Names: Abbas, Ali E. (Ali El-Sayed), editor. |
Tambe, Milind, 1965– editor. | Von Winterfeldt, Detlof, editor.
Title: Improving homeland security decisions / edited by Ali E. Abbas, University of Southern California, Los Angeles, Milind Tambe, University of Southern California, Los Angeles, Detlof von Winterfeldt, University of Southern California, Los Angeles.
Description: Cambridge, United Kingdom; New York, NY: Cambridge University Press, 2017. |
Includes bibliographical references and index.
Identifiers: LCCN 2017001016 | ISBN 9781107161887 (hardback)
Subjects: LCSH: National security – United States. | Internal security – United States. | Civil defense – United States.
Classification: LCC UA23.I338 2017 | DDC 353.3/2330973–dc23
LC record available at https://lccn.loc.gov/2017001016

ISBN 978-1-107-16188-7 Hardback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party Internet Web sites referred to in this publication and does not guarantee that any content on such Web sites is, or will remain, accurate or appropriate.

CAMBRIDGE

Cambridge University Press
978-1-107-16188-7 — Improving Homeland Security Decisions
Edited by Ali E. Abbas , Milind Tambe , Detlof von Winterfeldt
Frontmatter
More Information

Contents

List of Contributors *page* ix

1 Improving Homeland Security Decisions 1
ALI E. ABBAS, MILIND TAMBE, AND DETLOF VON WINTERFELDT

2 Probabilistic Risk Analysis and Terrorism Risk 5
BARRY EZELL, STEVEN P. BENNETT, DETLOF VON WINTERFELDT, JOHN SOKOLOWSKI, AND ANDREW J. COLLINS

3 Integrating Stakeholder Values into Strategic Planning through Comparative Risk Analysis 32
HENRY H. WILLIS AND RUSSELL LUNDBERG

4 Validating Terrorism Risk Assessment Models – Lessons Learned from 11 Models 54
JOHN LATHROP AND BARRY EZELL

5 Coping with Uncertainty in Adversarial Risk Analysis 85
VICKI BIER AND TONY COX

6 A Risk and Economic Analysis of Dirty Bomb Attacks on the Ports of Los Angeles and Long Beach 111
HEATHER ROSOFF AND DETLOF VON WINTERFELDT

7 Regional Transportation and Supply Chain Modeling for Large-Scale Emergencies 134
MAGED DESSOUKY, FERNANDO ORDÓÑEZ, ZHIHONG SHEN, AND HONGZHONG JIA

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-16188-7 — Improving Homeland Security Decisions
Edited by Ali E. Abbas , Milind Tambe , Detlof von Winterfeldt
Frontmatter
More Information

8 Economic Consequences of Terrorism and Natural Disasters: The Computable General Equilibrium Approach 158
PETER B. DIXON, MAUREEN T. RIMMER, GLYN WITTWER, ADAM ROSE, AND NATHANIEL HEATWOLE

9 Economic Resilience to Terrorism and Natural Hazards 193
ADAM ROSE

10 The Temporal Regional Economic Impacts of a Hurricane Disaster on Oil Refinery Operations: A FlexNIEMO Approach 220
JIYOUNG PARK, PETER GORDON, YUNKYUNG KIM, JAMES E. MOORE, II, AND HARRY W. RICHARDSON

11 Risk-Informed Benefit-Cost Analysis 238
SCOTT FARROW

12 Enhancing Post-disaster Economic Resilience: Public-Private Partnership for Insuring Terrorism 259
HOWARD KUNREUTHER AND ERWANN MICHEL-KERJAN

13 Economic Impacts of Changes in Wait Times at U.S. Ports of Entry 277
BRYAN ROBERTS, ADAM ROSE, NATHANIEL HEATWOLE, DAN WEI, MISAK AVETISYAN, FYNNWIN PRAGER, CHARLES BASCHNAGEL, AND ISAAC MAYA

14 Organizational Decision Processes 324
GREGORY S. PARNELL AND BARRY EZELL

15 A Value Model for Evaluating Homeland Security Decisions 344
RALPH L. KEENEY AND DETLOF VON WINTERFELDT

16 Identifying, Structuring, and Comparing the Objectives of Al Qaeda and ISIL 376
JOHANNES SIEBERT AND GREG KEENEY

17 Multi-objective Decision Making: Expected Utility vs. Some Widely Used (and Flawed) Methods 396
ALI E. ABBAS

18 Achieving Multiple Objectives with Limited Resources: Using Utility Theory and Control Theory 427
ALI E. ABBAS AND DUŠAN M. STIPANOVIĆ

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-16188-7 — Improving Homeland Security Decisions
Edited by Ali E. Abbas , Milind Tambe , Detlof von Winterfeldt
Frontmatter
More Information

19 Defender-Attacker Decision Tree Analysis to Combat Terrorism 445
RYAN J. B. GARCIA AND DETLOF VON WINTERFELDT

20 Decision Making for Bioterror Preparedness: Examples from Smallpox Vaccination Policy 469
EDWARD H. KAPLAN AND LAWRENCE M. WEIN

21 Stackelberg Security Games (SSG) Basics and Application Overview 485
BO AN, MILIND TAMBE, AND ARUNESH SINHA

22 Basic Solution Concepts and Algorithms for Stackelberg Security Games 508
CHRISTOPHER KIEKINTVELD AND MANISH JAIN

23 Mixed-Integer Optimization Methods for Solving Stackelberg Security Games 538
WILLIAM HASKELL AND FERNANDO ORDÓÑEZ

24 Methods for Addressing the Unpredictable Real-World Element in Security 574
JINSHU CUI, THANH H. NGUYEN, JAMES PITA, AND RICHARD S. JOHN

25 Learning to Play Stackelberg Security Games 604
AVRIM BLUM, NIKA HAGHTALAB, AND ARIEL D. PROCACCIA

26 Evaluating Deployed Decision Support Systems for Security: Challenges, Analysis, and Approaches 627
MATTHEW E. TAYLOR, CHRISTOPHER KIEKINTVELD, ERIC SHIEH, FRANCESCO DELLE FAVE, AND MILIND TAMBE

27 Homeland Security Resource Allocation Games: Considering Partially Strategic Attackers and Equity 678
XIAOJUN SHAN AND JUN ZHUANG

28 Decision Analysis by Proxy for Adaptive Adversaries 709
HEATHER ROSOFF AND RICHARD S. JOHN

29 Asymmetric Prescriptive/Descriptive Game Theory for Counterterrorism 730
JASON R. W. MERRICK AND PHILIP LECLERC

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-16188-7 — Improving Homeland Security Decisions
Edited by Ali E. Abbas , Milind Tambe , Detlof von Winterfeldt
Frontmatter
More Information

30 Near-Misses and Decision Making Under Uncertainty in the Context of Cybersecurity 745
ROBIN L. DILLON AND CATHERINE H. TINSLEY

Index 761

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-16188-7 — Improving Homeland Security Decisions
Edited by Ali E. Abbas , Milind Tambe , Detlof von Winterfeldt
Frontmatter
More Information

Contributors

Ali E. Abbas, University of Southern California

Bo An, Nanyang Technological University

Misak Avetisyan, Texas Tech University

Charles Baschnagel, University of Maryland, College Park

Steven P. Bennett, United States Department of Homeland Security

Vicki Bier, University of Wisconsin, Madison

Avrim Blum, Carnegie Mellon University

Andrew J. Collins, Old Dominion University

Tony Cox, Cox Associates

Jinshu Cui, University of Southern California

Francesco Delle Fave, Disney Research Boston

Maged Dessouky, University of Southern California

Robin L. Dillon, Georgetown University

Peter B. Dixon, Victoria University, Melbourne

Barry Ezell, Old Dominion University, Virginia

Scott Farrow, University of Maryland Baltimore County

Ryan J. B. Garcia, Rochester Institute of Technology

Peter Gordon, University of Southern California

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-16188-7 — Improving Homeland Security Decisions
Edited by Ali E. Abbas , Milind Tambe , Detlof von Winterfeldt
Frontmatter
More Information

Nika Haghtalab, Carnegie Mellon University

William Haskell, University of Southern California

Nathaniel Heatwole, University of Southern California

Manish Jain, Armorway Inc.

Hongzhong Jia, University of Southern California

Richard S. John, University of Southern California

Edward H. Kaplan, Yale

Greg Keeney, University of Southern California

Ralph L. Keeney, Duke University

Christopher Kiekintveld, University of Texas, El Paso

Yunkyung Kim, University of Southern California

Howard Kunreuther, University of Pennsylvania

John Lathrop, Decision Strategies, LLC

Philip Leclerc, Virginia Commonwealth University

Russell Lundberg, RAND Corporation

Isaac Maya, University of Southern California

Jason R. W. Merrick, Virginia Commonwealth University

Erwann Michel-Kerjan, University of Pennsylvania

James E. Moore, II, University of Southern California

Thanh H. Nguyen, University of Southern California

Fernando Ordóñez, Universidad de Chile

Jiyoung Park, University at Buffalo, The State University of New York

Gregory S. Parnell, University of Arkansas

James Pita, Armorway, Inc.

Fynnwin Prager, University of Southern California

Ariel D. Procaccia, Carnegie Mellon University

Harry W. Richardson, Autonomous University, State of Mexico, Toluca

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-16188-7 — Improving Homeland Security Decisions
Edited by Ali E. Abbas , Milind Tambe , Detlof von Winterfeldt
Frontmatter
More Information

Maureen T. Rimmer, Victoria University, Melbourne

Bryan Roberts, Econometrica, Inc.

Adam Rose, University of Southern California

Heather Rosoff, University of Southern California

Xiaojun Shan, University at Buffalo

Zhihong Shen, University of Southern California

Eric Shieh, University of Southern California

Johannes Siebert, University of Bayreuth

Arunesh Sinha, University of Southern California

John Sokolowski, Old Dominion University

Dušan M. Stipanović, University of Illinois at Urbana-Champaign

Milind Tambe, University of Southern California

Matthew E. Taylor, Washington State University

Catherine H. Tinsley, Georgetown University

Dan Wei, University of Southern California

Lawrence M. Wein, Stanford University

Henry H. Willis, RAND Corporation

Detlof von Winterfeldt, University of Southern California

Glyn Wittwer, Victoria University, Melbourne

Jun Zhuang, University at Buffalo

© in this web service Cambridge University Press www.cambridge.org