

Berichte aus der Volkswirtschaft

Silvia Ulli-Beer

Citizens' Choice and Public Policy

A System Dynamics Model for Recycling Management
at the Local Level

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Dedicated to

Arno,

Alexandra, and Sebastian

Foreword

René Dubos' maxim, "Think globally, act locally," has become part of the received wisdom of the global environmental movement. Silvia Ulli-Beer's new book provides practical guidance for solid waste managers at the local level who are striving to make this maxim a reality. The problem that Ulli-Beer tackles is creation of an analytic framework that can relate micro-level decisions made by individual households to macro dynamics of the solid waste policy market taken as a whole.

She begins with a behavioral model of local household decision making that invokes social and psychological factors that drive decisions about when to recycle what types of materials. Working within a single analytic frame shaped by a system dynamics model, she links this behavioral decision-making model to an aggregate view of investment, supply, and demand in the recycling market, all wrapped in a local, regional, and national policy-making framework.

While solid waste management in a single Swiss town bounds the problem focus, her approach is much more general. Issues involving the linkage between individual decision making and regional or even global variables are important to the problems of global warming, resource depletion, sustainable development, and fair trade, to name but a few. Most problems facing environmental managers striving toward a sustainable future can be informed by Ulli-Beer's path-breaking work. Hers is a general framework that needs to be developed and applied widely.

We at the University at Albany are proud to have played some small part in the creation of this work. While living at New Fadum Farm, Ulli-Beer spent a year in residence at the System Dynamics Group at the University at Albany building and refining her model, attending the Thursday Brown Bags, and participating in active research discussions with like-minded researchers.

During her year in residence, we all benefited from her lively and high-energy presence. We are pleased to share some small component of pride in this innovative and exciting work.

George Richardson and David Andersen

July 2004

Albany, New York

Preface and Acknowledgments

I remember one episode in a talk about the overall developments of the Swiss Nation relating to sustainability. A distinguished consulting firm was asked to evaluate the current state of the Swiss Nation in the light of sustainable development. The talk focused on the presentation of results from that study.

Evidence suggested that the economy is doing very well and that it is still growing, and the quality, and quantity of the natural environment is sustained, but the societal development is getting worse due to growing poverty, inequality and other factors. Then with this sectorized assessment, the policy-makers were left alone in the task of drawing policy implications and of developing comprehensive guiding policy strategies taking into account social, ecological and economic aspects. The talk left me behind with several questions: What is going wrong in a nation, in which the economy is flourishing but the society is wilting? What is wrong with the decision support models stemming from the economic theory which proposes that free economy will lead to a social optimum? Where do we stand now in the light of sustainable development? Which are the driving forces that drift the society towards poverty and inequality?

Those questions are still bothering me. They will not be addressed in this work but a related puzzling issue being addressed in this study on a smaller scale.

A similar paradox can be observed in the current throw-away-society. On the one hand we have a well-organized management of solid waste but on the other hand we have growing waste mountains and costs that are signs of inappropriate production methods and behavior. One way to alleviate this development is by fostering recycling efforts. In doing so, it is important to understand the driving forces that will render recycling initiatives successful in the light of sustainable development. What are micro-processes that will determine the success or failure of a recycling initiative or will lead to unintended consequences? What policy-interventions are promising? What are important preconditions for citizens to engage in recycling initiatives? How can the costs be covered? These are essential questions that should be addressed in order to understand the driving forces that will render recycling initiatives successful.

There exists a rich disciplinary fragmented body of knowledge in the scientific literature that would help address some aspects of those questions. But how can this knowledge be synthesized in such a way that it can inform the decision-making process about the multifaceted dynamically complex real-world issues?

In this book a thesis is presented, which endeavors to address observed phenomena of recycling dynamics from a comprehensive system dynamics perspective, drawing on the relevant disciplinary knowledge. In addition, it offers a decision support model for practitioners that will shed light on the dynamics and cumulative effects of a recycling initiative and should help understand the driving forces that control the observed development. Subsequently, the main intervention points that help steer the development in the desired direction can be identified. Hence, the purpose of this study was to try out an

innovative research approach that would provide adequate insights for practitioners, which would help them to deal with dynamically complex issues on the way to sustainable development. The purpose of this book is to spread this promising approach and different way of thinking among new generations of managers of sustainable development.

This work was not accomplished alone. I am deeply indebted to a wonderful adviser-team that contributed significantly to this work in many different ways. I owe many thanks to Professor Ruth Kaufmann-Hayoz from the University of Berne, who backed up the psychological issues and gave me support from the very beginning till the end of the study. It was due to her openness and trust that, I was able to take this innovative direction in exploring environmentally responsible behavior using a System Dynamics approach. I am especially grateful to Professor Markus Schwaninger from the University of St. Gallen for supervising the dissertation and for his guidance. His prompt and powerful feedback and suggestions, as well as his encouragement of my work, always helped me make tremendous progress. I am deeply indebted to him because he opened the door not only to a new body of thought but also to a whole scientific community, in which I found a home for my thoughts. He made it possible that I could work for one year in a highly inspiring research atmosphere, in the Department of Public Administration and Policy at the Rockefeller College SUNY, Albany. At SUNY, under the mentorship of Professor David F. Andersen and Professor George P. Richardson I learnt what it means to share thoughts between colleagues, to speak about and defend a research topic and to wrestle with research issues personally, as well as to trust in the help of friends. I owe more than I can express to David F. Andersen and George P. Richardson. I am touched by their commitment and their faith in my work. Their extremely stimulating insights and their warm-hearted support have inspired ambition in me that I was not aware of before.

Furthermore, I wish I could thank all my friends and colleagues who have provided valuable comments and encouraged me on the way to this book. Indeed, Aldo Zagonel, Mohammad Mojtahedzadeh, Rod MacDonald, Vedat Diker and Susanne Bruppacher deserve to be mentioned specially, since they not only helped to sort out many thoughts but also showed enthusiasm for this work and broadened my thinking in significant ways.

I also wish to thank Nandhini Rangarajan, Birgit Kopainsky and Kristjan Ambroz for cross-reading the manuscript and for their helpful comments. I also owe thanks to the local authorities, managers, consultants and experts participating in this investigation. Their perspective and wisdom has been crucial for the relevance of this work.

I highly appreciate the financial support of the SNF that was funding the research assistantship and the Basic Research Funds (Grundlagenforschungsfonds) of the University of St. Gallen. Without these grants this work never could have been accomplished. In addition I also would like to thank the research commission of the Bernese Prize for Environmental Research for awarding this work and the two industrial associations, the “Kantonal Bernischen Gewerbeverbandes” and the “Handels- und Industrieverein des Kantons Bern” that were funding the prize. This is a special honor and an important signal for the relevance of ecological transdisciplinary research for entrepreneurs.

Finally, I would thank all my friends that provided shelter and warmth to our kids, when their mum was preoccupied with this work and left them back for one year. I am heartily grateful to Anita Ulli-Müller and to my parents Margarete Beer-Heipt and Hans-Rudolf Beer. I am thankful that my father could glance at an earlier version of this manuscript.

This work is dedicated to my two children Alexandra, Sebastian and to Arno, my friend and husband. They are the strongholds that have enabled me to fight this challenging and exciting battle. I am not sure if I could ever give back to them what they have given me in terms of love and support during these demanding years.

Silvia Ulli-Beer

Langenthal, January 2004

Contents

1	INTRODUCTION AND OVERVIEW	1
1.1	The SPPE-Projects: “Overcoming barriers to change” and “Strategies and Instruments”	3
1.2	Overview	4
2	THE SCOPE OF THE STUDY: CITIZENS’ CHOICE AND PUBLIC POLICY	7
2.1	The objectives	8
2.1.1	The goals of the preliminary study	8
2.1.2	The goals and research questions of the main study	9
2.2	Definition of important terms	10
2.2.1	Environmentally relevant and responsible behavior	10
2.2.2	Citizens’ choice	11
2.3	Solid waste management in Switzerland.....	11
2.4	Deliberations on method choice	14
2.5	Contribution of the study	15
3	PREVIOUS RESEARCH AND THEORETICAL GROUNDING	16
3.1	Fields of research	16
3.1.1	An interdisciplinary perspective on environmentally relevant behavior and issues	17
3.1.2	Personal and contextual factors	21
3.1.3	Key concepts and building blocks explaining environmentally relevant behavior	22
3.1.4	Preliminary implications for the model development	25
3.2	Psychological theories and concepts explaining environmentally relevant behavior – identification of a research gap	25
3.2.1	Descriptive and normative theories of decision-making	28
3.2.2	The theory of planned behavior and environmentally relevant behavior.....	29
3.2.3	Social norms and behavior.....	32
3.3	An economic perspective on household choice and environmental policy.....	34
3.3.1	The theory of consumer choice	34
3.3.2	Reaching a social optimum of solid waste management.....	37

3.3.3	Conclusions on the Economic- and the System Dynamics- approach	39
3.4	System Dynamics models for solid waste management	40
3.5	Local government	43
3.6	Policy design, strategies and instruments	44
3.6.1	Solid waste management and strategies for a sustainable development.....	44
3.6.2	Types of instruments	45
3.6.3	Designing packages of environmental policy instruments	48
3.6.4	Why do citizens comply with environmental regulations and informal rules of conduct?	48
3.7	A synthesis of human behavior and policy.....	49
4	METHODOLOGY AND RESEARCH DESIGN	52
4.1	Aspects and overview of the applied methods	52
4.1.1	The study and its relation to leading research paradigms	52
4.1.2	System Dynamics and Group Model Building.....	58
4.1.3	Gaining confidence in System Dynamics models.....	62
4.2	The research strategy.....	66
4.2.1	Towards a System Dynamics model: computer-assisted theory building.....	66
4.3	Integrative Systems Methodology and research design	68
5	RESULTS - THE SD-SWM-MODEL.....	73
5.1	Results of the preliminary study: Reaching a consensus about driving forces determining consumption patterns and environmental impact	73
5.2	From a feedback perspective on human behavior to a System Dynamics model for solid waste management	78
5.3	Model conceptualization.....	80
5.3.1	Problem statement	80
5.3.2	Purpose of modeling.....	91
5.3.3	The overall SD-SWM-model structure	92
5.4	The sectors of the SD-SWM - model.....	95
5.4.1	Designing propensity to separate: The household decision sector.....	95
5.4.2	The household waste separation sector	100
5.4.3	The local policy sector	103
5.4.4	Outlook on an extended SD-SWM-model with additional sectors	107

5.5	Testing the model.....	110
5.5.1	Iterative model testing	110
5.5.2	Extreme condition tests.....	114
5.6	Model behavior and policy-experiments	118
5.6.1	Back-casting policy-experiments.....	122
5.6.2	Insights from the back-casting experiments	131
5.6.3	Forecasting policy-experiments.....	133
5.6.4	Insights from the forecasting experiments.....	152
5.6.5	Sensitivity Analysis	154
5.6.6	Conclusions on model testing	169
5.6.7	Policy-experiments under different scenarios.....	170
5.6.8	Insights from the policy-experiments under different scenarios.....	182
6	DISCUSSION AND REFLECTION ON POLICY, THEORY AND METHOD	186
6.1	Policy implications	186
6.1.1	What caused the problems?	187
6.1.2	How do you motivate households to participate in solid waste reduction and separation?	188
6.1.3	How do you recover recyclable material in order to recover competitive secondary raw material?.....	189
6.1.4	How do you finance the recovering and disposal activities?.....	193
6.1.5	Concluding remarks on policy implications.....	194
6.2	Framing SD model building and policy analysis with a feedback perspective on human behavior and public policy: a perfect complement.....	195
6.3	From a key-factor-perspective on environmental policy towards a key-loop-perspective on managing for sustainability.....	196
6.4	Reflections on the study and the research approach.....	200
6.4.1	Reflections on the frameworks	200
6.4.2	Strengths and limitations.....	203
7	CONCLUSIONS AND FUTURE DIRECTIONS FOR RESEARCH	206
7.1	Main insights and findings.....	206
7.1.1	Take home messages for practitioners.....	206
7.1.2	Relevant lessons for researchers	209

7.2	Suggestions for future research.....	210
7.2.1	Model improvements.....	210
7.2.2	Further development of the model.....	211
7.2.3	Ideas for further theory development on public policy issues.....	212
7.3	Afterthought on managing for sustainable development.....	214
8	LITERATURE.....	216
	LIST OF CHARTS.....	230
	LIST OF FIGURES.....	232
	LIST OF TABLES.....	234
	ANHANG	

Abbreviations

ESA	Environmentally sound action
REB	Responsible environmental behavior
SPPE	Swiss Priority Program Environment
SNF	Swiss National Science Foundation
CC&P and PPI	Citizens' choice and preferences and public policy initiatives
ISM	Integrative Systems Methodology
SD	System Dynamics
GMB	Group Model Building
SD-SWM-model	System Dynamics-solid waste management-model
ep	experienced peoples
iep	inexperienced peoples
wep	willing experienced peoples
wiep	willing inexperienced peoples
nwiep	not willing inexperienced peoples
nwep	not willing experienced peoples
gbc	garbage bag charge

Notation logic

In this work a System Dynamics Solid Waste Management model (SD-SWM-model) is described. In order to keep the terms in the book consistent with the variables names in the simulation model, the exact terminology is used. Those are indicated as follows:

<fraction separated> or *<iep willing to separate>*

A second peculiarity of this work are the identified loops, they are named and marked separately as follows:

“policy resistance” or “getting motivated”