

International Symposium

Supply Chain Management for Forest Sector and
Its Contribution to Local Economy

森林関連産業におけるサプライチェーンマネジメントと地域活性化

Abstract

Invited Speakers

Dr. Mikael Rönqvist

Norwegian School of Economy, Norway

Dr. Sophie D'Amours

Université Laval, Canada

Dr. Woodam Chung

University of Montana, U.S.

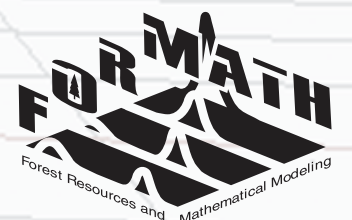
Dr. Katsuhiko Takata

Akita Prefectural University, Japan

Dr. Nobuyoshi Muto

Research Institute of Local Industries and Economy, Japan

森林計画学会



International Symposium on Supply Chain Management for Forest Sector and Its Contribution to Local Economy

Date : March 29, 2012

13:00-

Venue : Utsunomiya University

Organizer : Japan Society of Forest Planning

Risk Analysis Research Center, Institute of Statistical
Mathematics

Co-Organizer : Ecosystem Adaptability Global COE, Tohoku University

International Union of Forest Research Organizations (IUFRO)

Collaborator : Wood Utilization Systems Forum

President Shigejiro Yoshida, Ph. D. (Kyusyu Univ.)

Committee Members Naoto Matsumura, Ph. D. (Mie Univ.)

Masayoshi Takahashi, Ph. D. (FFPRI-Hokkaido)

Atsushi Yoshimoto, Ph. D. (ISM)

Nobuya Mizoue, Ph. D. (Kyusyu Univ.)

Toshiaki Owari, Ph. D. (The Univ. of Tokyo)

Masashi Konoshima, Ph. D. (Univ. of the Ryukyus)

In the forestry reactivating program recommended by the Forestry Agency in Japan, the effective use of forest resources has been demanded in order to stimulate local economic activities. However, due to the large number of small-scale forest owners, the efficiency of forest management is difficult to meet. This symposium is to gather expertises from theoretical to practical aspects and from the outside to inside of Japan for discussing and seeking some solution to overcome the problems incurred in Japanese forestry sector through the supply chain management.

森林関連産業における サプライチェーンマネジメントと 地域活性化 国際シンポジウム

日時：2012 3月29日

13:00-

場所：宇都宮大学

主催：森林計画学会

統計数理研究所 リスク解析戦略研究センター

共催：東北大学 生態適応グローバルCOE

International Union of Forest Research Organizations (IUFRO)

後援：木材利用システム研究会

座長 吉田 茂二郎（九州大学）

運営委員 松村 直人（三重大学）

高橋 正義（森林総合研究所 北海道支所）

吉本 敦（統計数理研究所）

溝上 展也（九州大学）

尾張 敏章（東京大学）

木島 真志（琉球大学）

林野庁が推し進める森林林業再生プランにおいては、地域活性化を念頭にした森林資源の有効な利活用が強く求められているが、小規模林家が多数を占める現状では、その実現は容易ではない。本シンポジウムでは、生産、加工、販売に至るサプライチェーンマネジメントに、理論及び国内外の実情を踏まえ、その効率的な運用に向けた取り組みと課題について議論する。

Program : March 29 (Thu)

13:00 - 13:30 **Registration**

13:30 - 13:40 **Opening Remarks**
- Shigejiro Yoshida, Kyusyu University

Session 1

Coordinator : Atsushi Yoshimoto, ISM

13:40 - 14:25 **Supply Chain Management in the Swedish Forest Industry**
Mikael Rönqvist
Norwegian School of Economics, Norway

14:25 - 15:10 **Value Chain Optimization in the Forest Sector of Canada**
Sophine D'Amours
Université Laval, Canada

15:10 - 15:55 **Recent Research Projects in the Western United States to Improve the Efficiency of Woody Biomass Supply Chains**
Woodam Chung
University of Montana, U.S.

15:55 - 16:25 **Break**

Session 2

Coordinator : Toshiaki Owari, The University of Tokyo

16:25 - 17:10 **Expectation to SCM in Japanese Forest Sector from Local Societal Viewpoint**
Katsuhiko Takata
Akita Prefectural University, Japan

17:10 - 17:55 **SCM in Forestry Sector from the End-User and Consultant Viewpoint**
Nobuyoshi Muto
Research Institute of Local Industries and Economy, Japan

17:55 - 18:00 **Closing Remarks**
- Atsushi Yoshimoto, ISM

18:00 - 20:00 **Open Discussion on the Issues Presented**
- Coordinator : Masashi Konoshima, University of the Ryukyus



Session 1 13:40–14:25

Mikael Rönnqvist

Professor

Norwegian School of Economics

Department of Finance and Management Science

Supply chain management in the Swedish Forest Industry

This presentation consists of four parts. First supply chain management (SCM) in general and its use in the forest industry is discussed. Then we describe three application areas arising in the Swedish forest industry. These are in turn collaborative logistics, logistics after a storm and forest biomass logistics.

The pulp and paper industry depends on a long and integrated supply chain. Forest products start in forest harvest areas as trees and end up as multiple products used in the day-to-day life of all people. The lead time from the first step to the last is long and involves many steps operated by several companies and organizations. In this overview we describe the supply chain in its entirety, its participants and the planning problems arising along the chain. We divide the planning problems into strategic, tactical and operative in a supply chain matrix, describe their characteristics and provide applications as illustrations. We discuss the need for information and decision support for planners in each of these areas. This relates to planning within a single company as well as integrated planning across several.

Transportation planning is an important part of the supply chain or wood flow chain in forestry. There are often several forest companies operating in the same region and collaboration between two or more companies is rare. However, there is an increasing interest in collaborative planning as the potential savings are large, often in the range 5–15%. There are several issues to agree on before such collaborative planning can be used in practice. A key question is how the total cost or savings should be distributed among the participants. In this part, we study a large application in southern Sweden with eight forest companies involved in a collaboration scheme. We investigate a number of sharing mechanisms based on economic models including Shapley value, the nucleolus, separable and non-separable costs, shadow prices and volume weights.

The storm Gudrun hit southern Sweden in January 2005 and approximately 70 million cubic meters of forest was wind felled. Existing logistic planning at forest companies in the storm damaged area had to be changed over-night. There was a direct shortage in both harvest and transportation capacities. Key questions that arose were which terminals to use, where to harvest, where to store and which transportation modes (truck, train, ship) to use. In this part, we describe how the forest company, Sveaskog, made use of Operations Research (OR) as an important decision support in their supply chain planning in the aftermath of the storm. The necessary development of the support was carried out quickly and the OR models and methods enabled efficient and detailed re-planning continuously as more accurate information about supply and new customers became available.

The use of forest fuel is increasing at heating plants in Sweden. Heating plants provide energy in the form of hot water for heating houses and apartments in local municipalities. Forest fuel are products obtained from harvesting in forests that cannot be used for further processing at sawmills and pulp and paper mills. Examples of such products are tree branches, tree tops and low quality logs. The optimization of the supply chain for round-wood (logs to sawmills, pulp and paper mills) and for forest fuel is similar but involves two main differences. First, forest fuel has to be converted into chips before delivery to the customer, and second, the demand for forest fuel varies over the year due to the temperature. To balance the chipping and transportation capacities over time, it is important to manage inventory levels at terminals. The optimization model developed provides decision support for questions regarding the choice of technology for chipping, where to perform the chipping operations, and the allocation of different assortments to heating plants. The system has been tested on a large case study from a Swedish forest energy company. The results show large savings and that the system is very useful for both planning and business development.

Professor Mikael Rönnqvist has recently taken up a position as professor in Industrial Engineering at Université Laval in Quebec, Canada. Before this he had the Statoil industrial Chair at the Norwegian School of Economic and partly at the Norwegian University of Science and Technology in Trondheim. He also has a background from Linköping University in Sweden and Auckland University in New Zealand. He is also working closely since many years with the Forestry Research Institute of Sweden (Skogforsk). Professor Rönnqvist completed his Ph.D. in Optimization at Linköping University in 1993. His research interests are in the areas of industrial and practical use of Operations Research, in particular in the forest industry. He has been involved in the development of many industrial decision support systems based on optimization in the areas of scheduling, routing, production planning, cutting and process control. He has won the EURO Excellence in Practice Award (2001 and 2003) and the EURO Management Science Strategic Innovation Price (2007). He was a Franz Edelman finalist in 2008.

1. J. Lundgren, M. Rönnqvist and P. Värbrand, *Optimization*, Studentlitteratur, Sweden, 537 pages, 2010. ISBN: 978-91-44-05308-0
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3. J.-F. Audy, S. D'Amours and M. Rönnqvist, An empirical study on coalition formation and cost/savings allocation, *International Journal of Production Economics*, Vol 136, 13-27, 2012.
4. J. Lundström, K. Öhman, K. Perhans, M. Rönnqvist and L. Gustafsson, Cost-effective age structure and geographical distribution of boreal forest reserves, *Journal of Applied Ecology*, Vol. 48, 133-142, 2011.
5. D. Bredström, P. Jönsson and M. Rönnqvist, Annual planning of harvesting resources in the forest industry, *International Transactions in Operations Research*, Vol. 17, No. 2, 155-177, 2010.
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7. D. Carlsson, S. D'Amours, A. Martel and M. Rönnqvist, Supply chain management in the pulp and paper industry, *INFOR*, Vol. 47(3), 167-183, 2009.
8. H. Broman, M. Frisk and M. Rönnqvist, Supply chain planning of harvest operations and transportation after the storm Gudrun, *INFOR*, Vol. 47(3), 235-245, 2009.
9. P. Flisberg, M. Rönnqvist and S. Nilsson, Billerud optimizes its bleaching process using online optimization, *Interfaces*, Vol. 39, No. 2, 119-132, 2009.
10. P. Eveborn, M. Rönnqvist, M. Almroth, M. Eklund, H. Einarsdóttir and K. Lidén, Operations Research (O.R.) Improves Quality and Efficiency in Home Care, *Interfaces*, Vol. 39, No. 1, 18-34, 2009.
11. P. Flisberg, B. Lidén and M. Rönnqvist, A hybrid method based on linear programming and tabu search for routing of logging trucks, *Computers & Operations Research*, Vol. 36, 1122-1144, 2009.
12. S. D'Amours, M. Rönnqvist and A. Weintraub, Using Operational Research for supply chain planning in the forest product industry, *INFOR*, Vol. 46, No. 4, 47-64, 2008.



Session 1 14:25–15:10

Sophie D'Amours

Professor

Université Laval, Canada

Value Chain Optimization in the Forest Sector of Canada

Canadian forest value networks are complex adaptive systems driven by socio-economical, technological and environmental forces. They extend in “time” and “space”, as the resource may take up to a hundred years to regenerate and is normally widely spread. They are composed of many units which can be associated to three tightly connected sub-networks: the resource network, the production and distribution network, and the recovery network. The resource network is responsible for managing the forest as well as for delivering the wood to the mills. The production and distribution network transforms the wood into products or services. It then sells and delivers the goods to the markets. The recovery network recuperates the residues and the products at the end of their useful life and then either recycles, refurbishes, uses as bioenergy or disposes of the products. The ownership of the network units can be shared between public and private organizations (firms). The links between the units vary depending on country legislations and enterprise business models. The main business streams are pulp and paper (e.g. newsprint, fine paper, tissue and packaging), wood products (e.g. lumber, panels, engineered wood products for structural or appearance application) and energy (e.g. green biomass, pellets, biogas). General concepts of value chain optimization in the forest sector will be reviewed in this presentation

In the FVN, one of the main challenges resides in the integration of the very long-term strategic planning of the resources network with the shorter time planning of its production, distribution and recovery networks; acknowledging the tight links between multi-objectives agents (e.g. collectivities, governments and industries) which either collaborate or, in some cases, compete for resources (e.g. logs, equipment, capital). Another challenge resides in the synchronization of the different activities (e.g. flows and resources allocation), conducted by different actors of the value networks, in order to meet market demands under strict resource constraints.

In this presentation, we will review some ideas supporting planning of forest and industry investment decisions as well as tactical and operational collaborative planning. Web based technologies will be presented. Silvi-Lab, is a tool permitting a group of decision makers to optimize collectively the forest planning. LogiLab permits government and businesses to optimize their industrial networks. Both are develop to support the integration of forest and industry investment decisions. They are also developed in order to permit “carbon mapping” of the long term forest and industry decisions.

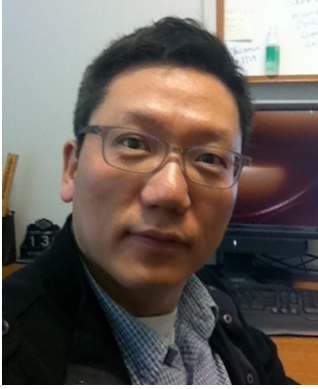
To improve the integration between industry and forest, we will discuss the need for coordination mechanisms. We will review traditional mechanisms and present the specific challenges of Canadian forest sector. We will present new ideas to integrate the planning process of different business units.

We will conclude by illustrating how value chain optimization is serving the Canadian communities in their effort to reengineer their forest sectors. Models used to establish the economic potential of emerging bio-products will be presented. The critical role of state policy will also be highlighted in the presentation. To conclude, Case studies of the Canadian forest industry will be used to showcase the research results. Methods proposed build on stochastic programming, agent-based simulation and game theory.

D'Amours holds both a senior Canada Research Chair and an NSERC Industrial Research Chair. She is the scientific director of the NSERC Strategic Network Grant on Value Chain Optimization and the former director of FORAC, successful research consortium that she built at Université Laval. FORAC has evolved to engage numerous partners from the forest product industry, the high-technology sector, and both public and private organizations. In recognition of the respect that she has earned, both in industry and academia, she was recently named Chair of the Board of Directors, of le Centre de recherche industrielle du Québec, as well as Vice-Dean, Research and Development, in the Faculty of Science and Engineering at Université Laval.

Over the years, professor D'Amours has served on different committees such as NSERC Grant Committees; FPInnovations Advisory Board, the Board of ACFAS and the Fondation pour l'alphabétisation du Québec. Finally, Professor D'Amours was awarded the YWCA Women Award in Technology (2003), the Practice Award from the Canadian Society of Operational Research (2007) as well as the "Distinction Henri-Gustave-Joly-de-Lotbinière" for an exceptional contribution to the forest sector in Québec.

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4. Santa-Eulalia L.A., Aït-Kadi D., D'Amours S., Frayret J.-M., Lemieux S. (2011). Applied Simulation, Planning and Scheduling Techniques in Industry, Production, Planning & Control, Special issue on «Applied Simulation, Planning and Scheduling Techniques in Industry »1366-5871, first published on 10-02-2011 (ifirst)
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Session 1 15:10-15:55

Woodam Chung

Associate Professor

The University of Montana, U.S.A

Recent Research Projects in the Western United Stated to Improve the Efficiency of Woody Biomass Supply Chains

Sustainable use of renewable resources, such as woody biomass, for energy production can play a major role in mitigating climate change impacts around the world. This presentation will begin with a brief discussion on the status of energy production and renewable energy policies of the United States, followed by a discussion on the key components and issues of supply chain and logistics management for woody biomass utilization for energy in the western United States. Literature review and results from various research activities are presented with an emphasis on improving cost efficiency and feasibility of woody biomass utilization. Recent woody biomass projects funded by the US federal government are discussed as the focus of the presentation. A general discussion of research approach and trends in supply chain improvement for woody biomass feedstock will conclude this presentation.

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2. Harrill, H. and H.-S. Han. 2010. Application of hook-lift trucks in centralized logging slash grinding operations. *Biofuels*. Vol.1(3):399-408.
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EDUCATION

B.S., Forestry, Seoul National University, Korea 1993
(graduated *cum laude*)
M.S., Forestry, Seoul National University, Korea 1995
Ph.D., Forest Engineering, Oregon State University, Oregon 2002

PROFESSIONAL APPOINTMENTS

2009 – present Associate Professor
The University of Montana, Montana

2002 – 2009 Assistant Professor
The University of Montana, Montana

1998 – 2002 Graduate Research Assistant
Oregon State University, Oregon

1993 – 1995 Graduate Research Assistant
Seoul National University, Seoul, Korea

FIELD OF INTEREST

Forest harvest scheduling, transportation planning, forest operations, woody biomass utilization, spatial modeling and decision support system development for natural resource management and planning

TEACHING EXPERIENCE

The University of Montana, 2002 – present, forest roads and resource transportation, forest planning, combinatorial optimizations for forest planning, GIS practicum, GIS applications in natural resources

PROFESSIONAL SOCIETIES AND SERVICE

- IUFRO Division 3.00 Deputy Coordinator (2010 – present)
- IUFRO Working Group 3.04 Coordinator (2010 – present)
- Croatian Journal of Forest Engineering International Editorial Board member (2008 – present)
- Council on Forest Engineering Award Committee member (2007 – present)
- American Society of Agricultural and Biological Engineers (ASABE, 2007 – present)
- Institute For Operations Research and the Management Sciences (INFORMS, 2008 – present)

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Session 2 16:25-17:10

Katsuhiko Takata

Professor

Akita Prefectural University, Japan

Expectation to SCM in Japanese Forest Sector from Local Societal Viewpoint

One of the most important roles of forestry and wood industries in local area is to activate local society. Forestry and the wood industry, however, have had the sad history which recognizes each other as an un-friendly partner who produces a disadvantage for a long time. Basically, they have to be the good business partners, and try to build up a new relationship at the place beyond the past complications. It means that a new business unit “forest industry” with adequate cooperation between forestry and wood industries can give an opportunity of employment and “raison d'être” for peoples live in local society. Optimized supply chain management (SCM) in forest sector should be an essential tool to construct the “forest industry”.

In this presentation we will discuss four issues;

- 1) sustainable and cascade type use of renewable forest resources
- 2) quantitative fit of demand from wood industries and supply from forestry
- 3) well-balanced practice of “product out” and “market in” in marketing stage
- 4) potential to create a new environment-friendly “forest industry” by optimized SCM.

RESEARCH INTERESTS

Forest Batany, Forest Genetics, Variation of Wood Quality, Genetic Diversity, Forest Tree Breeding

RESEARCH THEMES

Inherited Characteristic of Tree and Wood Quality
Changing of Wood Qualities based on Tissue and Original Physical Properties
Creation of Environment-conscious Industry and Society with Forest Material



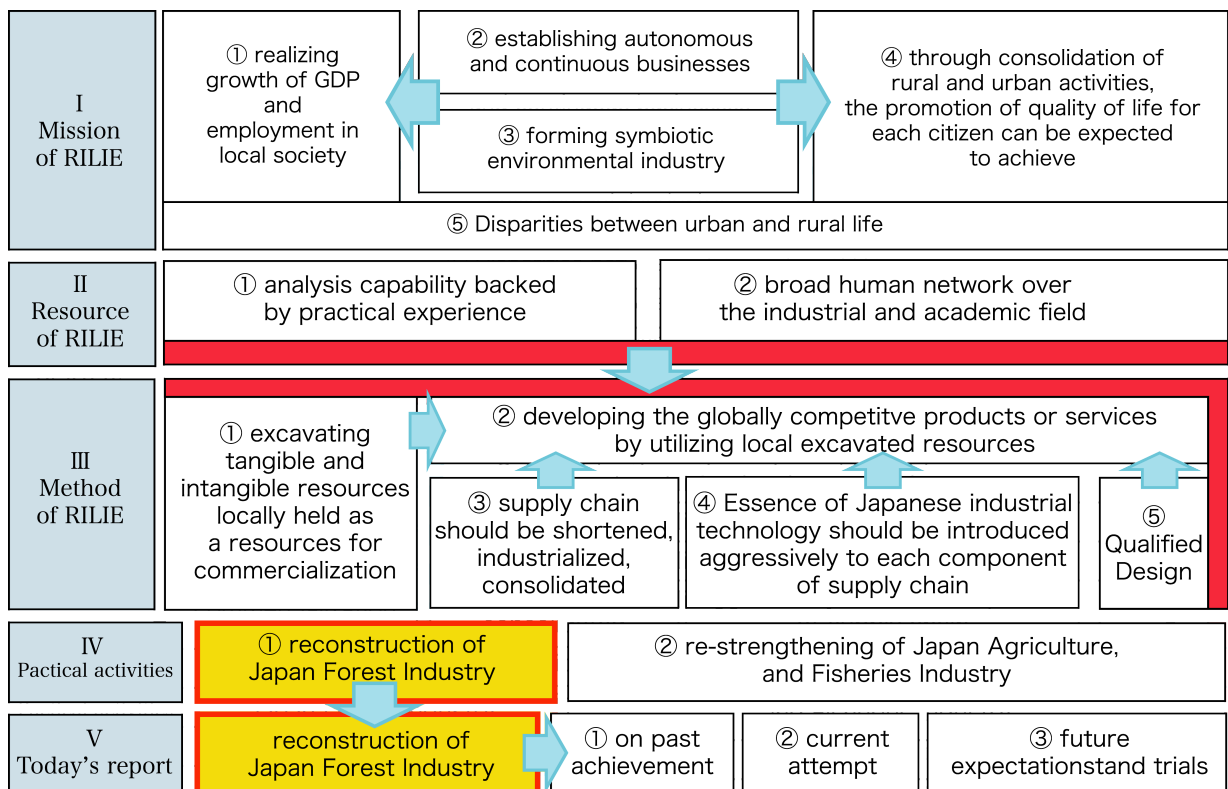
Session 2 17:10-17:55

Nobuyoshi Muto

Director

The Research Institute of Local Industry and Economics

SCM in Forestry Sector from the End-User and Consultant Viewpoint



I. Mission of the Research Institute of the Local Industry and Economy (RILIE) are

① realizing growth of GDP and employment in local society,

in order to achieve them

② establishing autonomous and continuous businesses,

especially

③ forming symbiotic environmental industry and the result of ①②③,

④ through consolidation of rural and urban activities,

the promotion of quality of life for each citizen can be expected to achieve.

II. In order to actualize the above mentioned mission, two resources held by the RILIE are effective. They are ① analysis capability backed by practical experience and ② broad human network over the industrial and academic field.

III. Methods to achieve the RILIE' s mission are at first ① excavating tangible and intangible resources locally held as a resources for commercialization, and at next ② developing the globally competitive products or services by utilizing local excavated resources. In order to realize item ②, there are 3 countermeasures. Regarding every component of supply chain related to the certain product or service, ③ supply chain should be shortened , industrialized and consolidated. ④ Essence of Japanese industrial technology should be introduced aggressively to each component of supply chain. Finally, ⑤ attempt to reinforce the design competitiveness for each product or service.

IV. Standing in the above mentioned point of view, RILIE has been attempting small efforts for ① reconstruction of Japan Forest Industry and ② re-strengthening of Japan Agriculture, and Fisheries Industry.

Today I will report on item ① that is reconstruction of Japan Forest Industry focusing on past achievement, current attempt and future expectations and trials.

EDUCATION

- 1971 Graduate from The Faculty of Law Chuo University
- 1989 Complete The Fuqua School of Business Executive Education
The Duke Program for Manager Development
- 2006 Complete The Doctoral Degree Program Entrepreneur Eng.
Course KUT

CAREER

- Mitsubishi Electric Corporation (MELCO)
- 1971 - Itami Works Cost Accounting Section
(Cost Accounting & Decision Making of Capital Investment)
- 1979 MELCO Head Office Controller Department
- 1983 Mitsubishi Semiconductor America Inc., Treasurer (Officer)
- 1996 MELCO Head Office Affiliate Companies
- Department Head of Business Planning Section
- 2000 MELCO Head Office General Manager of
Information Network - Business Promotion Department
- 2001 COO of Dream Train Internet Corporation
- 2002 Executive Trustee of Kochi University of Technology (KUT)
Vice President of KUT
- 2003 Head of KUT Research Collaboration Center
Outside Director of Celartem Technology (Additional post)
- 2004 Deputy Director of KUT Research Institute
- 2005 Chairperson of Kochi Industrial Promotion Center (Additional)
Chairperson of Kochi Eco Design Council (Additional)
- 2007 CCS Corp (JASDAQ Listed Company) Executive Vice President
Nikko Asset Management Auditor (Additional)
- 2008 The Research Institute of Local Industry and Economics (RILIE)
Director
- 2005 - 2009 Muroran Institute of Technology
Doctoral Program part-time lecturer (Venture Business
Management)

RECENT INTERESTS

Recently joint proposal with Tokyo Institute of Technology was adopted by Ministry of Education, Culture, Sports, and Science. The title is “Carbon dioxide reduction by creating more sophisticated timber industry”

Joint effort of making proposal for revitalizing Tohoku district were adopted by Ministry of Land, Infrastructure and Transport. These projects are focusing on activating sightseeing business and effective reconstruction system of destroyed social infrastructure,

Joint research activities with Tokyo Univ. for developing the advanced performance management system.

Other several independent efforts for revitalizing local society and economy

1. Nobuyoshi MUTO, “Change the paradigm toward Environmental Revolution in the 21st Century” Keynote speaker for Winter Symposium: Institute of Image Information and Television Engineers. 2009 Dec. 16
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