

No.219. Full paper for New Topics: Whole System Reconfigurations in the largest coal mining regions in Netherlands, Germany and Japan from 1950s to the present: Introductory Comparative Transitions Case Study

Satoru Mizuguchi, Junichi Fujino, Toru Ishii

Abstract

Energy transitions tend to bring wide range of whole system reconfigurations in energy, mobility, manufacturing and everyday life. The energy transitions in coal mining regions of Netherlands, Germany and Japan from 1950s to the present are not exceptions. From the production peak to near termination, they experienced whole system transformations. The observation could give us the clues for frictionless transitions from fossil fuel dependent economy to fossil fuel free economy.

This introductory comparative paper is composed by transition case analysis of the largest coal mining regions in three countries, Limburg of Netherlands, the Ruhr of Germany and Chikugo/Miike of Japan. The paper describes the interdependencies and the multiplicity of processes among changes in technology, business, politics, and everyday life.

The research question is what made big differences of whole system reconfigurations among them although the dimensions of ‘energy revolutions’ around 1960s, the frequency, the amplitude, the speed, and the scope may looks similar among the three cases?

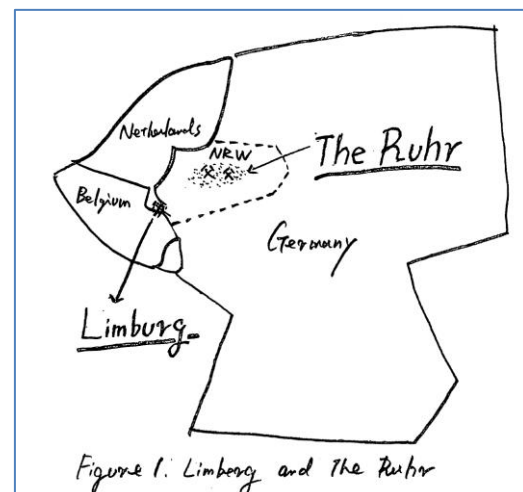
Applying transition concepts, the multi-level, the multi-phase, the multi-pattern, and lock-in, the method comprises dozens of interviews of key persons involved in transitions in the regions along with desk research.

Keywords: whole system reconfigurations; former coal mining regions; ‘energy revolutions’; structural change

Introduction: similar role, administrative status, ‘landscape’, but different outcomes

When Germany was the largest coal producer in Europe, the Ruhr was the ‘capital’ of coal and steel complex. The region was power house of 20th century’s two World Wars and ‘miracle of economic recovery’ after World War II.

The Ruhr area, not constituting an independent administrative entity, is Germany’s largest urban conglomerate of the federal states of North Rhine Westphalia (NRW), comprising 11 cities and 4 districts. Almost two generations after the age of King Coal was gone, the region has transformed into showcase as well as real-world experiments



stage, where new urban development with advanced clusters of renewable energy and environmental industry serving for regional quality of lives(QOL).

The sky above the Ruhr returned to blue from black as Willy Brant, chancellor from late 1960s to 1970s had promised. The Emsher, once the most polluted river in Germany, flows from east to west in the region, also returned to blue.



City of Essen, home of “Zollverein Coal Mine Industrial Complex”, UNESCO World Heritage(photo, right), is European Green Capital of 2017. City of Dortmund, once “the capital of coal, steel, beer”, turned to home of thousands of innovative small and median enterprise(SMEs) including IT, lighting, sensor, consulting, housing along with European distribution centers of Amazon and Ikea(Mask A, 2017, Mask B 2018,). Newly formed universities from the 1960s have made the basis for new industries as well as inviting foreign companies.

Between Essen and Dortmund located TyssenKrupp, the steel Giants, once referred as armor provider for Hitler (Gotting A,2014) now experimenting, a carbon capture and usage (CCU), producing chemical products from metallurgical gases. (photo,left, Mask C, 2017). InnovationCity Bottrop, project as well as public-private-partnership company, has been organizing more than 70 members of high-profile business and research institute for developing climate protection estates of

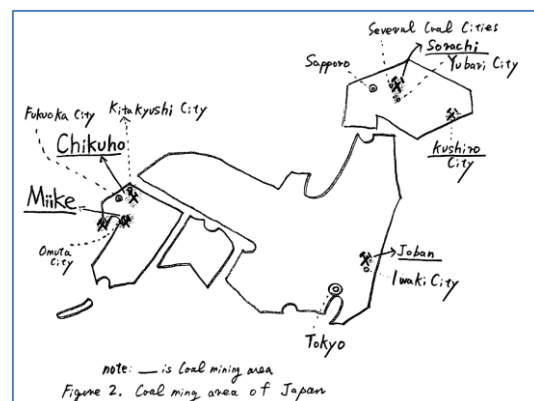


enhancing Quality of Living (InnovationCity Bottrop, 2105). Housing corporations in the region have entered the market. RAG, the coal mining company’s foundation has been preparing for the closure of the last mine(RAG,2018 and Ishii, 2017)

The Ruhr’s neighbor, Saerbeck and Villamedia, small municipalities, are on the pathway to 100% renewable communities (Mask D, 2017). The Ruhr’s population decline from the 1960s has stopped and beginning to grow (Mask E, 2017). Through coping with coal and steel crisis in the past, they have managed transition and achieved tangible structural results(Schpelmann et al., 2013). Whole systems, from energy to everyday lives are being reconfigured in the regions.

Southern part of Netherlands had big coal area too. Limburg(Figure 1) is also composed by several municipalities without constituting an independent administrative entity. Now she also takes similar steps like the Ruhr even though smaller scales. Like the German, the Dutch applied ‘transition management’ to cope with structural change. Now local entrepreneur organized energy start-up to tap heat from wasted mine water, creating districting heat and cold network. Residential development is also underway.

Japan had also “the Ruhr”. Chikuho-Miike, located in northern part of the southern main island of Kyushu (Figure 2), played similar role, serving



as armor factory since Japan-Russian war of 1905, and also for ‘economic miracle’ after World War II. Like the Ruhr, Chikugo-Miike is composed by several cities and towns without constituting an independent administrative entity. Kitakyushu, the largest city in the region, home of Big Steel, became the birth place of environmental industry like the Ruhr. Like the Ruhr, she established University and research institute for creating new industry. And she was selected as Eco-Model City by Japanese government, as City of Essen was chosen as European Green Capital. City of Omuta, where the largest coal mines located, also have “Coal Mine Industrial Complex”, UNESCO World Heritage (photo, right) and excellent coal museum, like Essen. The coal chemical companies in Omuta are still operating and producing highly valued products. However, the population is declining while the Ruhr turns to increase.



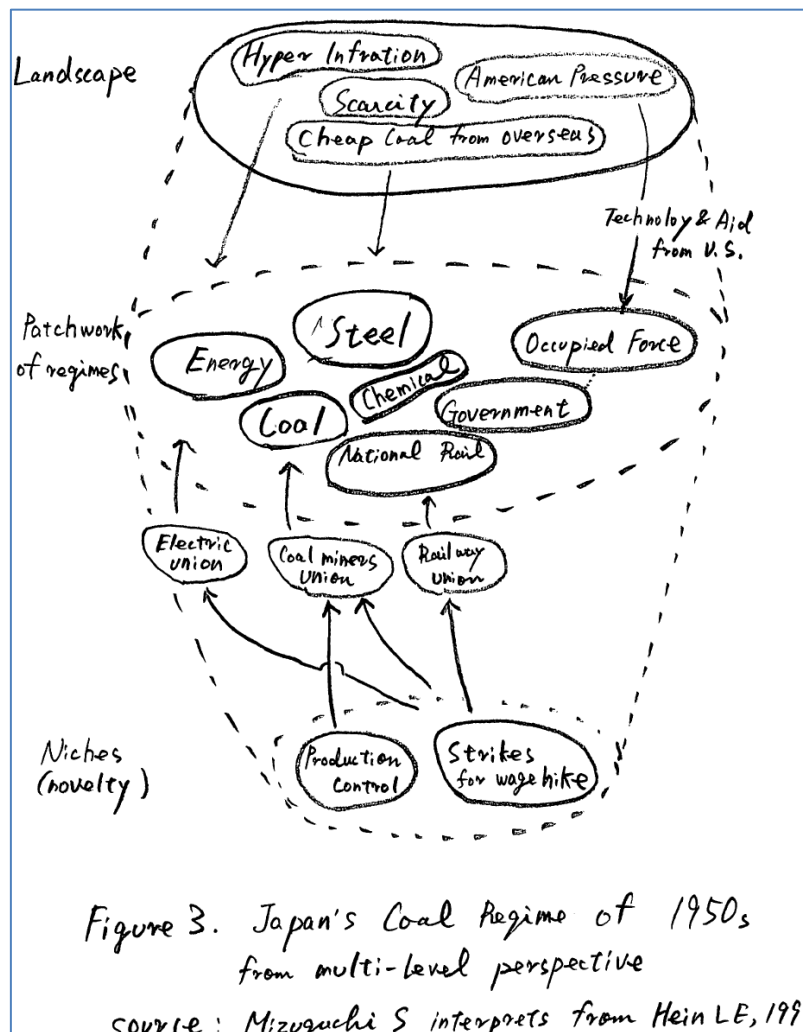
From the multi-level perspective point of view, the elements of ‘landscape’ (exogenous context) from the end of WWII to early 1950s of three regions seem to be similar. Cheap coal and oil from overseas, hyper-inflation, the scarcity of any kinds of goods constituted the landscape.

The difference is Netherlands had less American pressure and she discovered domestic gas later

while Japan had much American pressure politically, economically and culturally.

In post-war Japan, organizing labor unions was encouraged by U.S. government (occupied force), as democratization policy (Hein LE 1990). Coal miner’s union and electricity union in particular ascended to meso-‘regime’ for the first time in their history (Figure 3).

The priority production policy from the late 1946 to 1949 favored the industries. Lion’s share of government subsidies had flowed to coal and steel

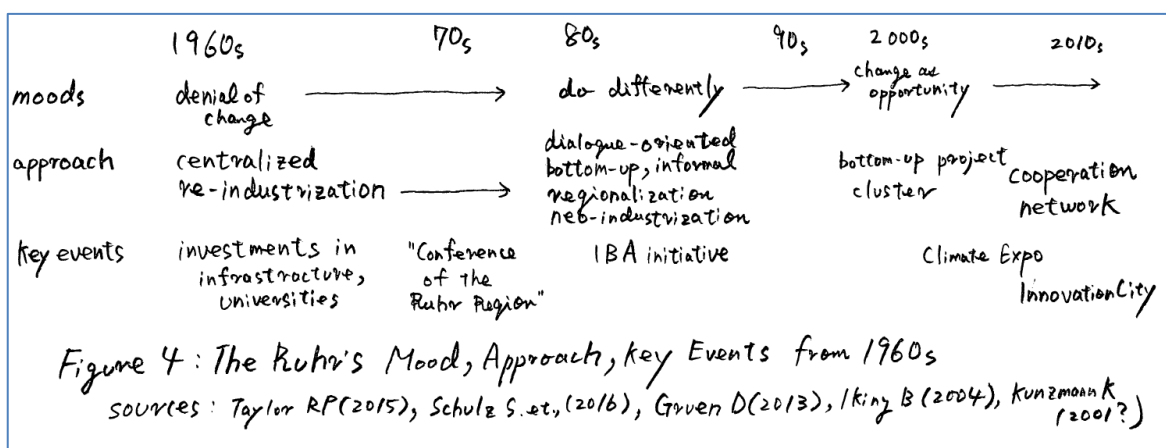


industries. Coal make steel, and coal was only energy source for Japan. Bare mountain produced almost no woods. And Japan has no big domestic oil field. Iron and steel were basis for basic infrastructure, which were destroyed by air raid of U.S force. Under the hyper-inflation and higher unemployment rate, the unions took series of general strikes for wage hike as well as against layoff, which lead to series of fierce confrontations with government and big coal companies from 1946 to 1960. Socialist party and communist party were competing to support unions, which made American government nervous about labor movement. Strikes and confrontation deteriorated stable production of coal, making big coal users including electric power, national railway, and chemical companies look for alternative fuels, which fastened decline of coal industry (Hein LE, 1990, Shimanishi T, 2011).

However, Tuchiya K(1975), an authority of coal mining industry analysed Japan's coal policy is not much different from Germany until 1960s, which comprised of social welfare & public works to absorb the unemployed, vocational training for young miners along with re-industrization approach through "modernization" policy to make coal production more efficient. The difference of national and regional policy after 1970s made Chikuhō-Miike different from the Ruhr.

Structural transformation: the Road Taken and the Road not Taken

The Ruhr's experience from 1950s has been analyzed as "industrial restructuring and local development responses by innovative approaches" (Hennings G et al., 1990), "regional innovation" (Hassink, 1993), "promoting innovation through technology networks" (Huggins R, 1995), "transition process from structural crisis to emerging of new clusters" (Bross U, 2000), "brownfield redevelopment" (Kunzmann KR, 2001), "promoting industrial change in structurally disfavored regions" (Iking B, 2004), inspiration source for restructuring Europe's rustbelt" (Hospers GJ, 2004), "eco-restructuring process as managed sustainable transitions" (Schpelmann et al., 2013), "paradigm shift from Grey to Green" (Gruehn D, 2013), "structural change" (Gotting A, 2010), "dramatic restructuring, away from its original coal and steel-based economy to a more diversified service economy" (Taylor RP, 2015), "managed coal phase-out" (Schulz S. et al., 2016), "Germany's Just



Transition from Coal” (Winland C, 2017).

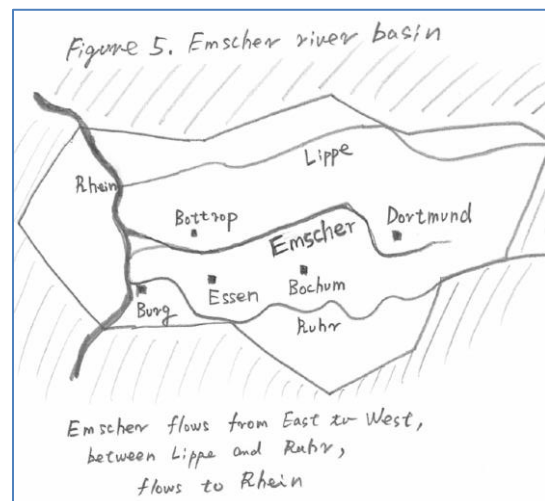
Bross U (2000) provides detailed chronology in the 1980s and 90s along with the brief overview of the historic development before 1980s. He describes relevant policies, strategies in national and regional governments for industrial, regional, technology infrastructure/transfer, basic/innovation infrastructure, education, labor/vocational training, R&D. As described in Figure 4, centralized re-industrialization policies were applied on the federal state and national levels until 1970s. In the Ruhr, government invested in infrastructure, formed universities for the first time in the region, which later providing the basis for new industries.

Japanese government provided large subsidies for coal mining companies to “rationalize” mines from 1946 to 1980s while searching for ‘natural termination of coal industry’ from 1960s (Yoda T, 1975, Mizusawa S 1980). In Netherlands, modernization and termination policies were pursued (Gales B, et., 2017). The big difference was Germany applied structural change management intentionally (Schpelmann et al., 2013). Japan did not have such clear policy (Yoda T, 1975). Netherlands introduced transition management between 2001 and 2004 (Rotman J and Loorbach D , 2010).

Any intentional transition tends to encounter “lock-in”. Hospers GJ(2004) describes three “lock-in” hampered structural change in the Ruhr. First was “economic lock-in”, resulted from Ruhr’s mono-structure. Second was “institutional lock-in” from the dense regional institutional tissue, a self-sustaining coalition of local business, politicians, labor unions and workers, whose only shared interest was the preservation of the existing structure, dubbed as “the weakness of strong ties”. Third was “cognitive lock-in”, the local parties’ over-optimistic view of the region’s potential, and the outsider’s one-dimensional, negative view of the Ruhrgebiet as an unattractive, polluted industrial region.

It (structural change) was not managed on the basis of a single masterplan, but the result of a multitude of plans and sustained efforts of numerous institutional and individual actors (Schepelmann et al., 2013). However, several papers point out International Building Exhibition (IBA) played a key role to overcome the “lock-ins” above. Kunzmann KR(2001) describes ‘5W1H’ of IBA Emscher Park Initiative as follows.

As late as the early 1980s, when brownfields started to become a public issue, the State Government of NRW established a rotating super fund for brownfields (\$ 250 million) to which local government were offered access, asked the State’s development Corporation to manage the



fund. It turned out, however, that the availability of financial sources was not the key constraint for successful brownfield redevelopment. Rather, it was the lack of ideas about what to do with the sites, which prevented its intended use. This is exactly what the ambitious IBA Emscher Park Initiative aim to do. It followed long-standing traditions of Building exhibitions in Germany which were initiated to demonstrate state-of-the art approaches to urban development.



The Initiative was a 10 year (1989 to 1999) undertaking which has been planned and programmed by the state Government of NRW to revitalize a 20 by 50 miles industrial rustbelt in the heart of the still heavily industrialized region with more than 5,000 acres of brownfields. In the late 1980s, the Ministry of Urban Planning and Transport of the State of NRW, inspired by its young and ambitious state minister Chirstoph Zopel and his creative advisors Karl Ganser and Wolfgang Roters, launched the regional development initiative for a 15 mile deep rustbelt corridor stretching 50 miles east from the river Rhine. In contrast to previous regional development programs, the initiative aimed primarily at changing the physical appearance of the Ruhr and the negative image of the region. Designed as a state initiative, the ambitious project was labeled: "A Workshop for the Future of Industrial Regions" (IBA 1988).

By-passing the established institutional setting of the region, a small development agency, rather a think tank, was established to do the work. It was led by a manager, who, again quite the exception in the region, came from outside the regional political milieu. He was appointed by the Government of the State of NRW and was given easy access to all state ministries and their budget lines for regional and urban policy matters. The lean agency (with less than 30 staff under an energetic manager recruited from outside the region) was supported by four types of hierarchical boards with members of the relevant state's ministries, as well as from regional institutions and local governments, local representatives and experts.

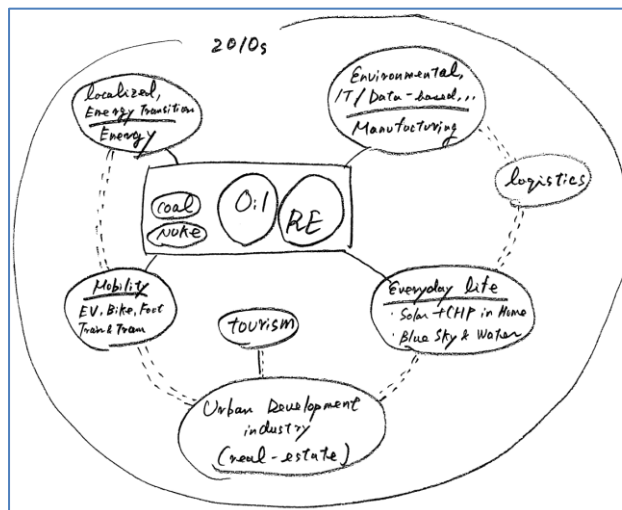
Along with harvesting state-of-the art approaches to urban development from IBA, combination of outsider and hierarchical boards might break "institutional lock-in" at least partially. Changing physical appearance of the Ruhr and the negative image of the region should have cracked "cognitive lock-in". The flagship project of the initiative is revitalization of the Emscher river system, which had been degraded to an open sewer as Germany's most polluted river. Summing up the following process, the initiative was success. The Emscher river turned blue (photo above). The previous physical landscape of the river basin had been characterized by vacant factories, closed mines, closed docks. Now they were turned into historical industrial monuments. Abandoned mining rail tracks made bicycle routes. Natural forest grew by itselfes (2015) and covered industrial heritage site.

south of Bottrop and represents the rich cultural and social diversity of the Ruhr district. Housing, employment, trade and commerce are intertwined in a small area.

By 2020 the city plans an exemplary application of a number of innovations in energy efficiency, decentralized power generation and electric transport. Bottrop developed solutions in a bottom-up way, through collaboration between scientific institution, business, politics and civil society.

IBA and the Innovation City Bottrop can be interpreted as not only show case projects but also as real-world experiments, and both projects relied on positive visions with clearly defined outcomes.”

Schepelman,et.,(2013) also suggested several environment and climate policy in national and federal levels enabled such projects. The author visited the restored Emscher river, headquarter of InnovationCity Bottrop, several city government offices and several energy-self-sufficient districts. Key component of the districts is the highly insulated residential buildings with energy producing



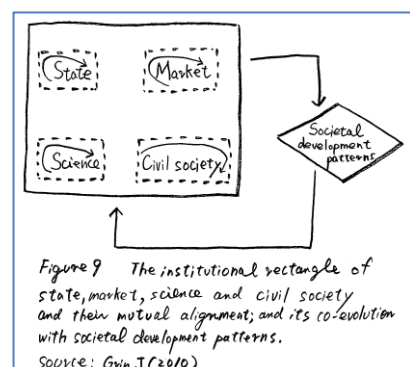
capacity, solar installation on the rooftop and CHP (Combined Heat and Power Generation fueled by biomass) at the basement. The former produces electricity during day while the latter produces during night. Landlord-to-tenant electricity act promoted that kind of building. The biomass, wood chip is harvested regularly in nearby parks and forest. Very often, the districts were former industrial sites, and environmental company not only cleaned the land but

also transformed it into bio-diverse ones.

The electric vehicle is available for the residents. Even climate-neutral kinder garden was built in Dortmund. Betting space was transformed into café with community center in Essen. In these districts, housing companies seems to have been playing cross boundary role, connecting such sectors as energy, mobility, housing, manufacturing and environmental industry, public institutions and everyday life, reconfiguring these systems. The real estate money connects whole systems.

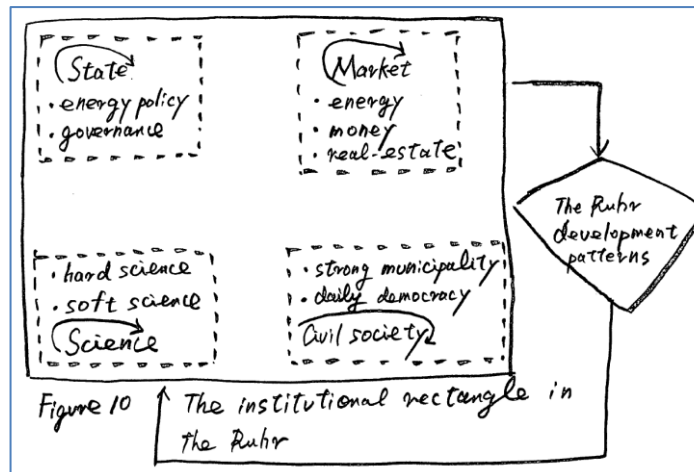
What made big differences of whole system reconfigurations among three regions?

Inspired by Grin J (2010) of Figure 9, the institutional



rectangle of state, market, science and civil society, the author summarizes the Ruhr's structural transformation in Figure 10.

"State" comprised energy policy and governance. As governance factors, federal state government had applied centralized approach until 1970s, however, they also introduced dialogue-oriented,



bottom-up and informal ones (Figure4,p4). Through doing IBA initiative, they even established a small development agency to by-passing the established institutional setting of the region (p6). The success of the agency lead to unique organization of InnovationCity Bottrop.

Both small organizations played as 'boundary spanner', not only breaking institutional silos but also exploring new forms of governance, which turned out to be effective for new urban development, reconfiguring such systems as energy, mobility, housing, food, commerce, manufacturing, environmental industry by quarter by quarter.

Second element of "state" should be energy policies in national, federal level and EU (Figure 6, p7). Phase-out law for nuclear power and hard coal, acts for climate protection as well as promoting renewable energy were passed, which provided foundation for urban development of climate-neutral. These elements of "state" did not exist in Netherlands and Japan except EU element for Netherlands. Especially, organizational silos is very rigid in Japan and method of cross-boundary is almost limited to organizing forum-style meetings.

"Market" is composed by three markets. First is energy market encouraged by policies mentioned above. Second is money market. European Development Bank(EDB) supplied structural fund to IBA and InnovationCity. European Community thought structural transformation of coal-based Ruhr into fossil fuel free Ruhr would make excellent showcase(Schpelmann et al.,2013). Green bond market also responded positively to energy transition in the Ruhr.

Third is real-estate market. Blue sky and blue river, bio-diversity richness, culturally rich environment are the favorable conditions for highly valued real-estate. And energy efficient housing in the area has positive image along with financial advantage. Limburg in Netherlands shares similar "market" while Chikuhō/Miike don't. Japan has national development bank, but less enthusiastic on climate issues partly because of the "backwardness" of its real estate market as well as less ambitious national energy policy.



Green bond market is just taking off. The “Backwardness” of Japan’s real estate market lies in its small share of secondhand housing. The housing value as asset is the highest when it newly built, but it soon continues to decline to zero after 30 years. This situation has been stagnating investment for renovation for energy efficiency because it has been nearly impossible to get return within 30 years. Since introducing the law for “promoting longer life housing” in 2007, the market is changing, but very slowly. The reason is complex. Along with ancient tax-system, Old habit and routines die hard.

“Civil society” is composed by strong municipality and daily democracy. Netherlands and Japan have rather strong central government and weak municipality although Netherland experiments variety of measures including citizen’s initiatives and urban labs.

“Science” comprised hard science like engineering, electronics for achieving carbon neutral as well as soft science like transition management. Netherlands have both. Japan used to be strong in hard science in the age of mass production, but is beginning to be behind in the age of IT/Data revolutions where the degree of interface with real market decides the technological progress. And stronger currency has been depriving manufacturers’ stamina since the Nixon Shock of 1973 to the present through Plaza Accord of 1985(Okamoto T, 2018) as “landscape”. Transition management is practiced tentatively in a smaller scale, so it is less visible among policy makers. Additionally, Netherlands and Japan were less enthusiastic to establish University and research institute for preparing for the knowledge society.

These state of four rectangles formation clearly make differences of scale, speed of transformation among three regions.

Some possible topics for research frontiers

As Cooke P(1995) has done, comparative study of structural change in post-coal mining regions were mainly conducted within the frame of advanced Western countries of similar political economy. Stohr WB(1990) as well as Szpor A and Ziolkwska K(2018) constitute exceptions. Hassink R(1993) and Taylor RP(2015) tried to learn from the Ruhr’s experience for Korea and China respectively, however, they did not have enough case studies of Korea and China.

From the climate change point of view, non-Western economies including China, India, South Africa, the gulf states and former communist countries are forecasted to be major greenhouse gas emitters in the coming decades. Their institutional rectangles could probably be more similar to Japan than the West. Because these countries share the history of “enforced” modernization by the West. They were not afford to have enough time to grow modern democracy and market economy from the bottom-up. So the German solution may not fit them without comparative studies.

Secondly, real estate business has been playing major role



as boundary spanner as well as “system integrator” in the Ruhr’s urban development. Even in the Chikuhō/Miike of Japan, where real-estate market is not comparable with the Ruhr, the local real-estate business are doing good work to revitalize vacant shopping streets(photo, previous page). Manufacturing companies are able to exit from the area when economic conditions change while local real-estate business normally won’t. However, few research seems to be conducted as to the inspiraritional and inovative role of local real-estate business in the post-coal area.

Role of community festival in post-coal area may also constitute research frontier. In Essen, they hold summer festival in the industrial heritage site. So do Chikuhō/Miike region. On this April, the author was walking in the downtown at Omuta city, home of Coal Mine Industrial Complex of UNESCO World Heritage. Facing the main street, several men were busily repairing festive float with dragon for summer festival. The festival in Omuta is famous for eight “roaring dragon with firework from the mouth” fight each other on the main street. One of them told me “ making preparation for the festival visible on the street is important to encourage local people. Summer festival attracts huge number of tourist. And the locals working outside Omuta returned home during the festival. Community festival has power to mediate citizen’s emotional depression since the last mine was closed”.

Japan has been suffering from rapid aging and low birth rate. However, population and birth rate is rising in the community keep organizing community festivals even under super-aging population. On the contrary, population is deceasing in the neighbor district where they gave up community festival. Through outsiders eyes, the physical appearance of the two neibouring quaters is similar. Communitiy festival seems to grow “responsible citizenship” for community, the foundation of civil society for coping with structural change. This could also make research frontiers.

References

- Abe T, Inaba M (2013) Former Mayor of Kitakyushu, Sueyoshi Kouichi Memoir (available in only Japanese as 前北九州市長 末吉興一聞き書き 挑む。巧む。走る、西日本新聞)
- Bross U, Walter HG (2000), Socio-economic Analysis of North Rhine-Westphalia, Joint Research Project INCO-COPERNICUS, Fraunhofer, Institute Systems and Innovation Research.
- Coal Energy Center (2015) Coal Note (only available in Japanese 石炭エネルギーセンター、コール・ノート)
- Davies S(1995) Training policy and practice in Wales and North-Rhine-Westphalia. In: Cooke O (eds) The Rise of the Rustbelt, UCL Press
- Energy Agency of Japan, www.enecho.meti.go.jp/recources_and_fuel/coal/policy.html(searched 29 March 2018)
- Fuse T (1982) Regional Structural Change, available in Japanese as 布施鉄治編著、地域産業変動と階級・階層 炭都・夕張/労働者の生産・労働-生活史・誌-、お茶の水書房、

- Gales B, Holskens R (2017) Coal Transition in the Netherlands, IDDRI and Climate Strategies
- Gotting A (2014) Structural Change in the Ruhr region – Problems, potentials and developments. In: IET Working Papers Series No. WPS03/2014
- Grin J(2010) Contemporary Processes of Institutional Change In: Grin J, Rotmans J, Schot J, in collaboration with Geels F and Loorbach D, Routledge, pp237-248
- Gruehn D (2013) Paradigm Shift in the Ruhr Region: From Industry to Innovation – From Grey to Green, searched in 1 May 2018
- Hassink R (1993) Regional Innovation Policies Compared. In: Urban Studies, Vol. 30, No.6, 1993, pp1009-1024
- Hein EL (1990) Fueling Growth, The Energy Revolution and Economic Policy in Postwar Japan, Council on East Asian Studies, Harvard
- Hennings G and Kunzmann R.K (1990), Priority to local economic development :industrial restructuring and local development responses in the Ruhr area – the case of Dortmund, In: Stohr BW (eds) Global challenge and local response, Initiatives for Economic Regeneration in Contemporary Europe, pp199-223. The United Nations University, Mansell Publishing Limited
- Holskens R, Lubke S and Hasselkuss M (2018) Social innovations in the German energy transition: an attempt to use the heuristics of the multi-level perspective of transitions to analyze the diffusion process of social innovations, Springer Open
- Huggins R& Thomalla R (1995), Promoting innovation through technology networks in North-Rhine-Westphalia, Edited by Philip Cooke, The Rise of the Rustbelt, UCL Press
- Ikari K(1980), Making Hawai from Abandoned Coal Mine, available in Japanese as 猪狩勝巳、ハワイアンセンター物語、加納活版所、昭和 55 年
- Ikeda W(1980) Regional Development and Urban Transformation through declining main industry, Kyushu University, available in Japanese as 池田亘、基幹産業の衰退にともなう地域振興政策と都市空間の変容に関する研究 - 福岡県大牟田市の都市ガバナンスに着目して - 、九州大学への修士論文
- Iking B (2004) Promoting industrial change in structurally disfavoured regions – The case of the “Ruhr Valley” in Germany – with special emphasis on the current restructuring plan of the city of Dortmund, searched in
- Ishigaki N(1988) Study of History on German Mining Polic, Ochanomizu-shobo, available in Japanese as 石垣信浩、ドイツ鉱業政策史の研究、お茶の水書房、1988 年
- Iwaki City() History of Joban Coal mine, available as 常磐炭田史、いわき市史別巻
- Iwamoto N 岩本直、特定地域振興政策の政策効果に関する研究 - 産炭地域振興政策による各産炭地域の政策効果について -
- Jong T.P.R.D (2004) Coal Mining in the Netherlands; The Need for a Proper Assessment. In:Geologica Belgica (2004) 7/3-4, pp231-243

Kitakyushu University(2003) Industry and Society for the City of 21th century, available in Japanese as 北九州市立大学 北九州産業社会研究所、21 世紀型都市における産業と社会 - 北九州市のポストモダンに向けて、海鳥社、

Kumagai H(2012) Nuke in the past and Coal in the present, available in Japanese as 熊谷博子、むかし原発、いま炭鉱 - 炭都 [三池] から日本を掘る、中央公論新社、2012 年

Kumagai H(2005) movie: Miike Coal Mine, Never Ending Story, available in Japanese as 熊谷博子、監督、映画『三池 終わらない炭鉱の物語』、2005

Kobori S(2010) Energy Revolution in Japan – Modern History of Resource Scarce Nation (only available in Japanese as 小堀聡、日本のエネルギー革命 - 資源小国の近現代、名古屋大学出版会)Nagoya University Press

Kodama T(2001) 児玉俊洋、三井三池炭鉱閉山後の炭鉱離職者の再就職状況に見る労働者の転職可能性、RIETI Discussion Paper Series 01-J-004

Komori O(1997) Regional Development of Japan Way, available in Japanese as 小森治夫、日本型地域開発、文理閣、1997

Kozuma S(1980) History of Miike Coal Mine, available in Japanese as 上妻幸英、三池炭鉱史、教育者

Kunzmann RK () Creative Brownfield Redevelopment

LeeS(2006) movie: Hula girl, 李相日、監督、フラガール

Omuta City()福岡県大牟田市、構造改革特別区域計画、

福岡県大牟田市、大牟田市、主要施策の成果及び基金の運用状況説明書、昭和 62 年～平成 17 年（抜粋）

福岡県大牟田市、年表と写真で見る大牟田市の 100 年、2017

福岡県大牟田市、大牟田市中核的拠点整備基本計画報告書（要約版）平成 9 年 3 月

福岡県大牟田市、大牟田市中核的拠点整備実施計画報告書（概要版）平成 10 年 3 月

福岡県大牟田市、三池炭鉱の歴史と技術～大牟田市石炭産業科学館ガイドブック～

福岡県大牟田市、ユネスコスクール・ESD のまち おおむた 2018

福岡県 法期限後の産炭地域振興指針、平成 14 年 4 月

福岡県の歴史、山川出版社

Mizusawa S(1980) Coal Yesterday Today Tomorrow, available in Japanese 水沢周、石炭 昨日 今日 明日、築地書館、1980 年

Mask A to K(2015) Mizuguchi S, the author interviewed several key persons during COP23, International Climate Negotiation Conference at Bonn, Germany on 2015. Since Mizuguchi S did not yet get permission from the interviewees, he used 'Mask' for not revealing their identity.

Nishihara J(2002) 西原純、斎藤 寛、産業のリストラクチャリング期における炭鉱閉山と三階層炭鉱労働者の帰趨 - 長崎県三菱高島炭鉱の事例 - 、人文地理 第 54 巻第 2 号 (2002)

Nagasaki H(2015) 長崎英範、凶弾 小説 団琢磨、秀明社

Nagasue T(1973) 永末十四雄、筑豊 - 石炭の地域史、NHK ブックス

NRW'S Press Tour during COP23

RAG Stiftung (2018) <http://www.rag-stiftng.de/en/> searched 2 April, 2018

Rotman J and Loorbach D (2010), Case Study I: Parkstad Limburg: Regional Transition Management. In: Grin J, Rotmans J, Schot J, in collaboration with Geels F and Loorbach D, Routledge, pp161-179

Rytsevekd VJ and Visser J (1996) Robust corporatism, still? Industrial relations in Germany. In: Jelle, Rytsevekd VJ and Visser J, eds, Industrial Relations in Europe - Traditions and Transitions, Open University

Samuels JR (1987) The business of the Japanese State, Energy markets in comparative and historical perspective, Cornell

Schepelmann P, Kemp R, Klement J, Schneidewind U (Jan 2013), The eco-restructuring of the Ruhr area as an example of a managed transition, conference paper, www,,,,, searched in,,,,

Schulz S& Schwartzkopff J (July 2016) Instruments for a managed coal phase-out: German and international experiences with structural change, E3G, www.e3g-org, searched April 2, 2018

Sumiya M (1968) Analysis of Japan's Coal Industry (only available in Japanese as 隅谷三喜男、日本石炭産業分析、岩波書店) Iwanami shoten, Japan

Shimanishi T (2011) Post-War History of Japan's Coal Industry – Market Structural Change and Corporate Action (only available in Japanese by 島西智輝、日本石炭産業の戦後史 - 市場構造変化と企業行動、慶応義塾大学出版会)

Shimanishi T (2011) Rationalizing Small Coal Mines in Postwar Japan: An Analysis on the MITI's Rationalization Guidance to Small Coal Mines, Mita business review. Vol.54, No.5 (2011.12), pp91-110 (Aside from abstract, main paper is only available by Japanese through 島西智輝、高度成長期日本における中小炭鉱合理化対策 - 中小炭鉱合理化指導の分析 - 、三田商学研究、慶応義塾大学出版会)

Shimanishi T (2005) Mass Fight and Coal Miner's Labor Movement, abstract is available in English , main paper is only available by Japanese through 島西智輝、炭鉱労働組合運動における大衆闘争の形成に関する考察 - 戦後復興期の三井炭山砂川炭鉱労働組合の事例を中心に - 、三田商学研究第 47 巻第 6 号 2005 年 2 月、pp53-78

Shimanishi T (2009) Factors causing delay in business diversification of declining industries : a study on coalmining industry in postwar Japan 島西智輝、衰退産業における事業多角化の遅滞要因の検討 : 戦後石炭産業の事例、三田商学研究第 51 巻第 6 号 2009 年 2 月、pp161-177

Shimanishi T (2005) Major coalmining companies during the early period of post-war rationalization : the Hokkaido Colliery and Steamship Company Ltd. And the sub-leasing of coalmines from the early 1950s to the early 1960s 島西智輝、戦後石炭産業合理化初期における大手炭鉱の合理化と租鉱権炭鉱 - 1950 年代初頭~1960 年代初頭の北海道炭鉱汽船の事例を

中心に～、『社会経済史学』70-6 (2005年3月)

Shimanishi T (2013) 島西智輝、1950～70年代半ばの日本における未利用天然資源の活用 - 石炭産業の事例 - 、香川大学経済論業 第85巻 第4号 2013年3月 pp241-268

Shimazaki N(2013) 嶋崎尚子、石炭産業の収束過程における離職者支援、日本労働研究雑誌 No.641/December 2013

Shimizu K(2015) 清水一利、常磐音楽舞踊学院 50年史 フラガール物語、講談社、2015年

Shiraishi M(2006) 白石まみ、フラガール、メディアファクトリー、2006年

Shimono K 下野克己、戦後日本石炭化学工業史、お茶の水書房、1987年

Shiroyama H and Kajiki S (2015) Case Study of Eco-town Project in Kitakyushu: Tension among Incumbents and the Transition from Industrial City to Green City. In: Loorbach D, Wittmayer J, Shiroyama H, Fujino J, Mizuguchi S (eds) Governance of Urban Sustainability Transitions, pp113- 132, Springer, Tokyo

Shoda S(1987) 正田誠一、九州石炭産業史論、九州大学出版会、1987年

Stohr BW, Introduction (1990) Global challenge and local response, Initiatives for Economic Regeneration in Contemporary Europe. In: The United Nations University, Mansell Publishing Limited

Stohr BW (1990) On the theory and practice of local development in Europe. In: Stohr BW (eds) Global challenge and local response, Initiatives for Economic Regeneration in Contemporary Europe, The United Nations University, Mansell Publishing Limited

<http://www.tankou.org/modules/tankou3> searched at 24 April

Tanigo K()谷合佳代子、炭鉱離職者と関西の労働運動 (1)、関西大学?

Taylor PR (2015) A Review of Industrial Restructuring in the Ruhr Valley and Relevant Points for China, Institute for Industrial Productivity, searched at ,,

Tsuchiya K, Inaba S (1961) New Development of Energy Policy – European Reality and Japan's Problem(only available in Japanese by エネルギー政策の新展開 - 欧州の実態と日本の問題点), Diamond co. Japan

Toonen G. P. W (1972) The Economic Restructuring of South Limburg between 1965 and 1971. In: TIJDSCHRIFT VOOR ECON. EN SOC. GEOGRAFIE – MEI/JUNI 1972

Vinck E and Boursin J (1962) The development of the public and private sectors of the coal mining industry in Europe: A comparative study

Yada T (1975) Japan's Coal Industry after World War II (only available in Japanese by 矢田俊文、戦後日本の石炭産業 - その崩壊と資源の放棄 - 、新評論) Shin-Hyouron Co. Japan

Yada T (1996) 矢田俊文、国土政策と地域政策、大明堂、1996年

Yada T (1990) 矢田俊文、地域構造の理論、ミネルヴァ書房、1990年

Yoshida T (2009) 吉田 廸夫、「負の遺産」を大牟田再生のエネルギーに!!、自治研究論文部門優秀賞、第32回自治研集会

Yoshida T(2013) 吉田 廸夫、三池炭鉱閉山から 15 年、廃坑後から未来が見えた！

Yoshioka T(2018) 吉岡宏高、明るい炭鉱、創元社、2018

Yoshimura S(1984) 吉村朔夫、日本炭鉱史私注、お茶の水書房、1984 年