

Social Learning in Facing Challenges of Sustainable Development: A Case of Langat River Basin, Malaysia

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Abstract: This study explains the findings of the research on implementation of Integrated River Basin Management (IRBM) in Langat river basin, Malaysia. This study utilized institutional analysis and development framework to identify institutional challenges associated with IRBM implementation in the study area. Three categories of action arena were defined and scope for stakeholder participation in decision making was identified. This analysis revealed that polycentric institutional arrangements under Federal administration are capable to coordinate and integrate river basin management by extending the scope for iterative learning processes that could address institutional challenges for adaptive and ecosystem based management approaches. Using stakeholder interview data, binary logit regression model and ordinal regression model analyses were carried out to find out present effect of influencing factors of IRBM implementation and outcome of present learning environment in study area. R^2 value for these model analyses were 0.41 and 0.27, respectively at 1% significance level. It was found that social learning could significantly influence IRBM implementation in the study area (Odd ratio for social learning was 17.11). It has opened up scope for future research in the study area. Finding of this study is envisaged to be useful to those who are concerned to strategize IRBM and sustainable development and further research on LRB and else where.

Key words: Institutional Analysis and Development (IAD) framework, sustainable development, social learning, Langat river basin, regression model, Malaysia

INTRODUCTION

There is wide diversity in theoretical perspective, disciplinary heritage and language for social learning (Wales and van der Leij, 2007). But scholars, policy makers, researchers water managers and environmentalists are increasing supportive of social learning for better environmental management and sustainable development. Many European countries have utilized social learning for Integrated River Basin Management (IRBM).

Stakeholder participation in decision making through collective choices and learning for natural resources management are the main bases of the conceptualization of this social learning. Therefore in this study, social learning was conceptualized for IRBM implementation in Langat River Basin (LRB) under local context by taking insights from Blackmore *et al.* (2007), Pahl-Wostl (2002,

2007), Pahl-Wostl *et al.* (2008), Tippet *et al.* (2005) and edited research of Wals (2007). Geographical location of LRB has made it the most important river basin in Malaysia particularly to meet the increasing potable water demand for growing economy, agricultural activities and household needs of Kuala Lumpur and its adjacent urban areas.

This basin has been a fast growing region in this country in terms of rapid urbanization, new build-up areas, modern road network, industrialization and agricultural expansion having undesired consequences of land use and land cover changes, pollution stress, forest fragmentation, depletion of ecosystem services and thus posed numerous challenges of sustainable development. Under such circumstances, implementation of IRBM in this river basin was deemed necessary. IRBM is considered as a subset or logical planning as well as implementation unit of Integrated Water Resources

Management (IWRM) which is not only a holistic approach of contemporary policy paradigm but also policy strategy for sustainable development. It is commonly defined as a process to promote the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (Biswas, 2004; Cardwell *et al.*, 2004; Funke *et al.*, 2007; GWP, 2000, 2003, 2004; Hooper, 2006; Jonker, 2002; Kemper *et al.*, 2007; Newson, 2009; Rahaman and Varis, 2005).

The Government of Malaysia has adopted this approach right from endorsing it in the major national policy documents, enacting law and reforming organizational setup for better coordination and cooperation among concerned agencies of water resources management. Side by side the Selangor Waters Management Authority (locally called Lembaga Urus Air Selangor or LUAS) was formed in 1999 by the Selangor Waters Management Authority Enactment 1999 as pioneering state level river basin organization in Malaysia Langat River Basin (LRB) from among three river basins of Selangor State and one of 189 river basins of Malaysia has been brought under IRBM implementation processes through forming this river basin organization since 1999 (CapNet-UNDP, 2008; LUAS no date). LRB is also globally recognized as UNESCO led Evolving HELP (Hydrology for Environment, Life and Policy) basin. Water management challenges, facing in this river basin are at advance stage of typical urbanization problems. The general observation on the performance and outcome of IRBM practices in LRB for the last one decade revealed that IRBM implementation should not be considered as ad hoc strategy or discrete programme for sustainable development at river basin scale but an iterative cycle of policy process that simultaneously encompasses policy planning and implementation where scope for stakeholder engagement for learning should present.

While government agencies are doing their best to achieve sustainable development in this basin, there are still some institutional challenges which need immediate attention, especially for individual stakeholders' participation in the decision making processes. Social learning is now getting increasing popularity for engagement of stakeholders in decision making. After literature review it was strongly believed that adoption of social learning can bring change in institution which will be responsible for desired policy outcome of sustainable development in LRB. Following this assumption, effort

was made to find the institutional challenges associated with social learning adoption and its significance to influence IRMB implementation in LRB under local context. This article has explained all the methodologies that were applied and their results in the following sections.

Results of this study strongly suggest that social learning could be a significant influencing factor for IRBM implementation in LRB and thus can be adopted to face challenges of sustainable development in this important river basin. Finding of this study is envisaged to be useful to those who are concerned to strategize IRBM and sustainable development and further research on LRB and else where.

MATERIALS AND METHODS

Study area: LRB is a trans-state river basin and situated at the mid western part of Peninsular Malaysia. A map of LRB is shown in Fig. 1. Total population of this river basin was >1.59 million in 2008 (DoSM, 2008) and it is expected to increase to 2.50 million by 2050. Increasing population means increasing water demand and more disposal of pollutants and new settlements in the area. Similar to population growth, economic growth results into rapid urbanization, industrialization, more road networks, new built-up areas, land-use and land cover change and agricultural expansion. Thus protection of environment is under increasing stress. It is not only the consequences of population increase or economic growth, climate change impact and associated extreme events are also growing concerns for study area. Thus the area is not free from sustainable development challenges where development will be inevitable while environment will create wicked problems.

Methodology: In this study, institutional arrangements of LRB were analyzed by literature review. Then Institutional Analysis and Development (IAD) framework (Ostrom, 1986; Imperial, 1999) was used to define major action arenas, rules-in-use and action situations in LRB. For water resources management and utilization each of us has stake. So to make it simple, while categorizing action arenas, all actors (individuals and organizations) were categorized as primary and secondary stakeholders. Primary stakeholder was one who enjoyed products and services from the river basin but not formally engaged/employed with agency(ies) responsible for managing products and services of river and associated resources. A secondary stakeholder might or might not be getting products and services but was formally engaged/employed with agency(ies) responsible for

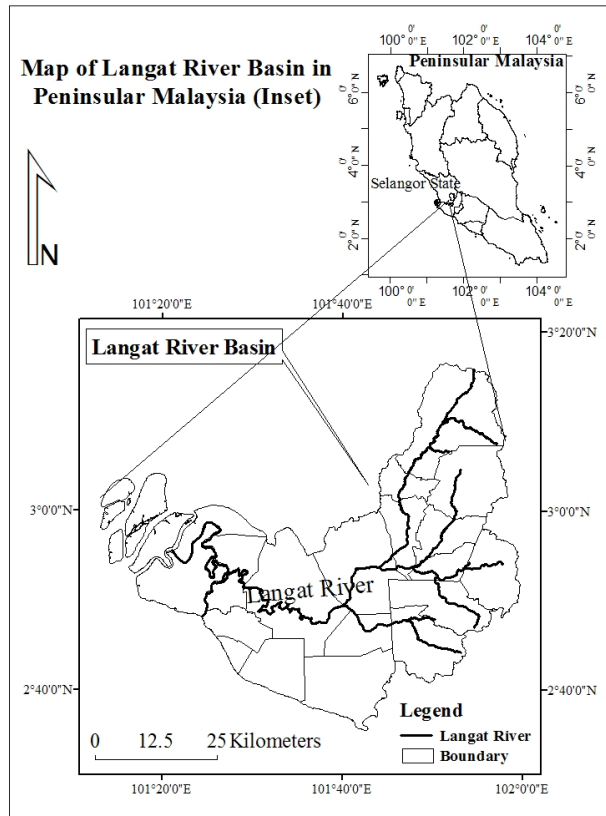


Fig. 1: Map of LRB in Peninsular Malaysia (Inset)

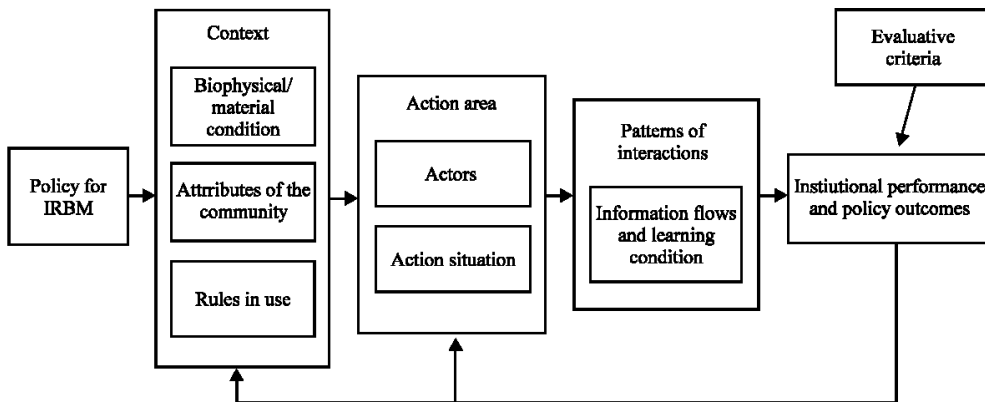


Fig. 2: Institutional Analysis and Development (IAD) framework used in this study; Modified from Andersson (2006), Imperial (1999), Ostrom (2005), Ostrom *et al.* (1994), Kiser and Ostrom (1982)

managing products and services of river basin and associated resources. Indeed secondary stakeholders played dual roles because he/she became a primary stakeholder after his/her office work while staying with the family or community.

Main focus of the institutional analysis was to determine the learning environment for inter-organizational network and individual actors associated

with IRBM implementation in LRB under local context. Figure 2 shows structure and variables of IAD framework as used in this analysis.

A stakeholder interview was also carried out at village level by applying random sampling method. A total of 181 randomly selected stakeholders were interviewed from purposively selected three different locations of river basin (up stream region, middle stream region and down

stream region) during three different Gotong-royong events held between 22-03-2009-9-08-2009. Gotong-royong event is considered as a strong local institute of Malay community who comprises 61% of total population. People from the community voluntarily join this event to contribute in environmental and community activities. Appropriate statistical and social methods were carefully followed to avoid errors in data collection, entry and analysis. Using this interview data, two regression models (binary logit model and ordinal regression model) were run using Eviews 5 software of the Quantitative Micro Software, LLC. These model analyses were carried out to test following two hypotheses as part of policy forecast (Agresti and Finlay, 1997; Dunn, 1994):

- Present effect of influencing factors of IRBM implementation among stakeholders in LRB under local context
- Evaluation of outcomes of present learning environment in LRB

RESULTS AND DISCUSSION

Institutional arrangements

Policy: Literature review revealed that a number of national policies are in existence that guide overall development and management of water and associated natural resources predominantly by sectoral approaches. Major national policies that are related to the IRBM implementation are National Forestry Policy 1992; National Policy on Biological Diversity (1998); National Policy on the Environment (2002); National Wetlands Policy (2004); National Physical Plan (2005); National Urbanisation Policy (2006); National Agriculture Policy (2006) and National Biotechnology Policy (2006).

Law: At least 19 laws and acts (formal rules) such as Waters Act 1920, Local Government Act 1976, Street, Drainage and Building Act 1974, Irrigation Area Act 1953,

the National Land Code 1965, Environmental Quality Act 1974, Pesticides Act 1974, Land Conservation Act 1960, Town and Country Planning Act 1976, the Fisheries Act 1985, Poisons Act 1952, Mining Enactment 1929, National Forestry Act 1984, Protection of Wildlife Act 1972, National Parks Act 1980, Sewerage Services Act 1993, The Drainage Works Act 1954, Water Services Industry Act 2006 and Selangor Waters Management Authority Enactment 1999 are in use to provide sectoral services and decision supports for IRBM implementation in LRB but only a few rules have the provision for primary stakeholder participation in decision making processes as shown in Table 1.

Organization: There are a number of organizations and agencies that are responsible and associated with IRBM implementation in LRB. An inter-organizational network has been formed for IRBM in LRB which is shown in Fig. 3.

Institutional analysis

Action arena for IRBM in LRB: Defining action arena is the primary task to delineate boundary of an institutional analysis using IAD framework (Aligica, 2006; Andersson, 2006). There are a number of actors and organizations within and beyond the geographical boundary of LRB and participate in decision making by forming certain pattern of action arenas for IRBM implementation in LRB. Therefore, to simplify and to minimize the tasks, action arenas were grouped in three categories in order to understand the pattern of participation and learning situation in river basin management. While grouping action arenas, actors were also characterized as: primary stakeholder and secondary stakeholder as defined in methodology. Indeed these secondary stakeholders play dual roles as primary stakeholder after office period while staying with the community. In case of water use and IRBM, roles and responsibilities of these kinds of stakeholders are rather higher than the primary stakeholders. Based on field observation and literature

Table 1: Legitimate provisions of stakeholder participation in decision making

Law/Acts	Provisions	Remarks
The environmental quality Act 1974	Public participation in the implementation of the environmental impact Assessment on prescribed project	Procedures or mechanisms of participation were not defined
The Town and Country Planning (Act 1976), 1984	Public participation is in the form of public viewing and written comments on local plans and structure plans	Dissatisfied citizen can claim against the decision of the compensation or other planning proposal
By law of the Ministry of Works (Government Order)	Scope for public opinion survey prior to road design	Not legally defined
Selangor Waters Management Authority Enactment 1999	Formation, operation and management of stakeholder groups, Encourage local area management committees and stakeholder groups to work with the authority	Functions, powers and duties of the authority are defined to involve stakeholders in the sustainable development and conservation of water sources
Agenda 21 of the Selangor State	Public participation is encouraged in project planning and implementation as part of implementing Action Plan	Public participation is considered as part of the implementation strategy

Modified from DID (2003)

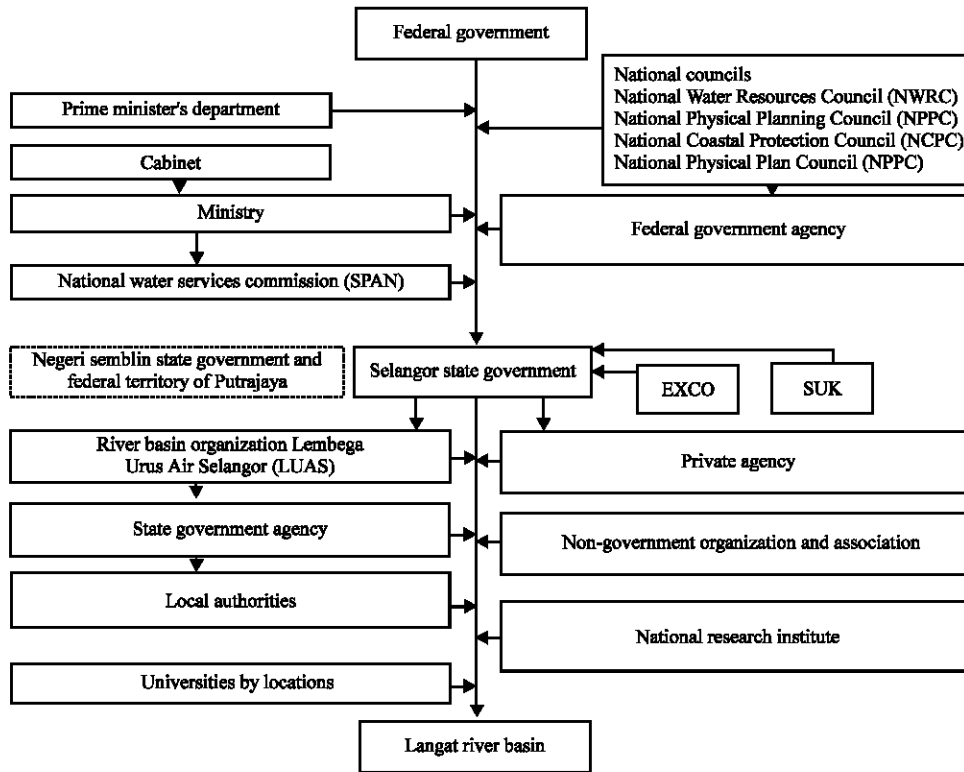


Fig. 3: Inter-organizational Network for IRBM in LRB

Table 2: Table of major action arenas, level of rules-in-use and resulting action situation within LRB

Action arena	Actors and their interactions	Level of rules in use	Action situation
Action arena 1	Federal Government and State Government	CNR	Pro-active in process but complexity in hierarchic structure and beyond the reach of primary stakeholders to influence rule making process
Interactions among the secondary stakeholders	Among National Councils	CNR	
	Within National Water Resources Councils	CNR	
	Among Ministries	CNR and CCR	
	Ministry and Federal Departments	CNR and CCR	
	Within each ministry	CCR and OPR	
	Federal Departments and State Departments	CNR, CCR and OPR	
	Within Federal Departments	CCR and OPR	
	State Department and State Department	CCR and OPR	
	Within State Departments	CCR and OPR	
	State Departments and local authority	CNR, CCR and OPR	
	Selangor State Government, Negeri Sembilan State Government and Federal Territory of Putrajaya	CCR and OPR	
	Among local authorities	CCR and OPR	
	SPAN and Concessionaires	CCR and OPR	
	LUAS and other government agencies	OPR	
LUAS and research organizations and universities	OPR		
Action arena 2	LUAS and water users and local communities	OPR	Active in nature and collective choice arena open for community
Interactions between primary stakeholders and secondary stakeholders	SPAN and water users and members of water forums	CCR	
Action arena 3	Among water users	OPR	Inactive and free ride problem
Interactions among primary stakeholder	Among local communities	OPR	

Level of rules in use: Constitutional rule = CNR; Collective Choice Rule = CCR and Operational Rule = OPR). SPAN = Suruhanjaya Perkhidmatan Air Negara; LUAS = Lembaga Urus Air Selangor

review, major action arenas, level of rules-in-use and their resulting action situations for IRBM implementation in LRB were defined as shown in Table 2.

It is very clear that actors within the inter-organizational network (action arena 1) are active in decision making and service providing. Formation of the

Suruhanjaya Perkhidmatan Air Negara (SPAN) and the Lembaga Urus Air Selangor (LUAS) and enactment of associated laws have created scopes for collective choice arena (action arena 2) for individual stakeholders. In action arena 3, individual actors are inactive for decision making. This study suggests that individual stakeholders (primary stakeholders) may join in decision making by adopting social learning through available local institutions like Gotong-Royong activities, mosques, temples and churches.

Policy forecast

Present effect of influencing factors of IRBM implementation among stakeholders in LRB under local context: The R² of the regression was 0.41, meaning the explanatory variables can explain 41% of the dependent variables. Based on the moderate value of R², the overall model (LR statistics) has been found statistically significant at 1% significance level. Binary logit model summary is shown in Table 3.

Evaluation of outcomes of present learning environment in LRB:

In this analysis, R² value was 0.27. It means that the explanatory variables can explain 27% of the dependent variable. Based on the moderate value of R², the overall model (LR statistics) has been found statistically significant at 1% significance level. Ordinal regression model summary is shown in Table 4.

The statistical output from the binary regression analysis suggests that individual characteristics or personal responsiveness of people has significant relationship with peoples' knowledge and interest about IWRM. Among several indicators of personal responsiveness, personal responsiveness about flood, individual interest to join co-management and interest to join social learning process have found significantly effective for IRBM implementation in LRB at 3, 4 and 1% significance level, respectively. A 1 unit increase of personal responsiveness about flood, IRBM implementation in LRB will be influenced by 3.89 times by

Table 3: Binary logit model summary

Variables	Coefficient (β)	Z-stat	p-value	Odd-ratio (e ^β)
α (Constant)	0.44	0.28	0.78	1.56
X ₁ (Age up to 30 (Dummy variable, where age up to 30 = 1, Other = 0))	-0.06	-0.08	0.94	0.94
X ₂ (Age 30-50 (Dummy variable, where age 30-50 = 1, Other = 0))	-0.61	-0.89	0.37	0.54
X ₃ (Gender (Dummy variable, where Male = 0, Female = 1))	-0.09	-0.13	0.90	0.92
X ₄ (Geographical position upstream (Dummy variable, where Upstream = 1, Other = 0))	-0.92	-1.18	0.24	0.40
X ₅ (Geographical position Downstream (Dummy variable, where Midstream = 1, Other = 0))	-1.23	-1.53	0.13	0.29
X ₆ (Knowledge about river- connectivity with langat river) (Dummy Variable where, Yes = 1, No = 0)	-0.29	-0.32	0.75	0.75
X ₇ (Awareness on river contribution to livelihood of family) (Dummy variable, where Yes = 1, No = 0)	0.20	0.26	0.80	1.23
X ₈ (Personal responsiveness about flood (Dummy variable, where Yes = 1, No = 0))	1.36 [^]	2.22	0.03	3.89 [^]
X ₉ (Interest to join Co-management (Dummy variable, where Yes = 1, No = 0))	1.43 [^]	2.11	0.04	4.17 [^]
X ₁₀ (Interest to join social learning (Dummy variable, where Yes = 1, No = 0))	2.84 [*]	3.69	0.00	17.11 [*]
X ₁₁ (Problem of Water Shortage (Dummy variable where Yes = 1, No = 0))	0.36	0.49	0.62	1.43
X ₁₂ (Affected by Flood (Dummy variable, where Yes = 1, No = 0))	-1.55	-1.37	0.17	0.21
X ₁₃ (Knowledge about LUAS (Dummy variable where Yes = 1, No = 0))	0.09	0.13	0.89	1.10
X ₁₄ (Experience on water related campaign/ training (Dummy variable, where Yes = 1, No = 0))	-0.87	-1.16	0.25	0.42
X ₁₅ (Involve with Water quality monitoring programme (Dummy variable, where Yes = 1, No = 0))	0.68	1.10	0.27	1.98

*, [^], ~ indicates significant level at 1, 5 and 10% significance level

Table 4: Ordinal regression model summary

Variables	Coefficient (Ω)	Z-stat	p-value	Odd-ratio (e ^Ω)
Z ₁ (Performance of river water quality enforcement (Ordinal data, where 1= Bad, 2 = Fair, 3 = Good))	1.25 [*]	7.44	0.00	3.48 [*]
Z ₂ (Quality of sewerage services (Ordinal data, where 1 = Bad, 2 = Fair, 3 = Good))	0.35 [^]	2.08	0.04	1.42 [^]
Z ₃ (Quality of the solid waste management (Ordinal data, where 1 = Bad, 2 = Fair, 3 = Good))	0.15	0.82	0.41	1.16
Z ₄ (Authority responsiveness about flood (Ordinal data, where 1 = Bad, 2 = Fair, 3 = Good))	0.02	0.09	0.93	1.02
X ₁₄ (Joined water related campaign/ training (Dummy variable, where Yes = 1, No = 0))	0.30	1.38	0.17	1.35
X ₁₅ (Involve with water quality monitoring programmes (Dummy variable, where Yes = 1, No = 0))	0.14	0.77	0.44	1.15
X ₄ (Geographical position upstream (Dummy variable, where Upstream = 1, Other = 0))	0.28	1.22	0.22	1.32
X ₅ (Geographical position downstream (Dummy Variable, where Midstream = 1, Other = 0))	-0.22	-0.92	0.36	0.80

*, [^], ~ indicates significant level at 1, 5 and 10% significance level; the odd ratio is calculated as e^Ω

stakeholders. A 1 unit increase of co-management joining interest of stakeholder, may influence IRBM implementation by 4.17 units. A 1 unit increase of social learning process, may influence IRBM implementation by 17.11 times. These percent suggest that social learning could be a powerful determinant for governance outcome by influencing knowledge and interest among stakeholders for IRBM implementation in LRB under local context.

The statistical output from ordinal regression model showed that among the direct functions responsible for outcomes under present learning environment in LRB, perception of river water quality enforcement has significant impacts at 1% significance level. The odd ratio was 3.48, meaning the perception on enforcement has good impact on perception on river water quality. Similarly perception on the quality of sewerage service also has significant impacts on the perception of river water quality at 5% significance level. The odd ratio was 1.42. Other two direct functions of independent variables namely quality of solid waste management and responsiveness about flood have no significant impacts on the perception of river water quality monitoring.

Social learning: For LRB, social learning was defined as a process of learning by doing together and balancing top-down and bottom-up approaches of decision making that is done by gradually improving stakeholder participation beyond informative or consultative participation which might end up with them co-designing and co-deciding the mechanism. The main philosophy of social learning is the continuous capacity building by learning together to manage together any issue that prevails in a society (Wolters *et al.*, 2006). Considering

existing inter-organizational network, a framework of social learning in LRB has been developed to provide better scope of individual stakeholders in decision making for IRBM implementation in LRB as shown in Fig. 4.

After two decades of talk and debates on sustainability and sustainable development, it has become more clear about what is unsustainable than what is sustainable (Wals and van der Leij, 2007). There are a number of approaches people are adopting for sustainable development which is always faced by numerous challenges. IRBM implementation in LRB is one of such approaches facing numerous challenges. It is well documented that an appropriate institution can overcome many of these challenges. Therefore, institutional aspects of IRBM implementation were taken care of under this study. Analysis of institutional arrangement clearly indicated that legal provision of stakeholder participation in decision making is still inadequate.

A critically important element within IWRM approach and its implementation through IRBM is to integrate various sectoral views and interests in the development and implementation framework (Jonch-Clausen, 2004). Therefore, there is sufficient reasons to view IRBM implementation in LRB not only from sole interest of water demand management and water resources conservation but also its pivotal role playing interests in cross sectoral issues which are part of sustainable development and largely confined within different policy documents. Therefore, it is believed that there should have linkage between policy processes and IRBM implementation which need collaboration, coordination and stakeholder participation at all levels. Under present policy paradigm, while policy decisions are demanded from stakeholders by

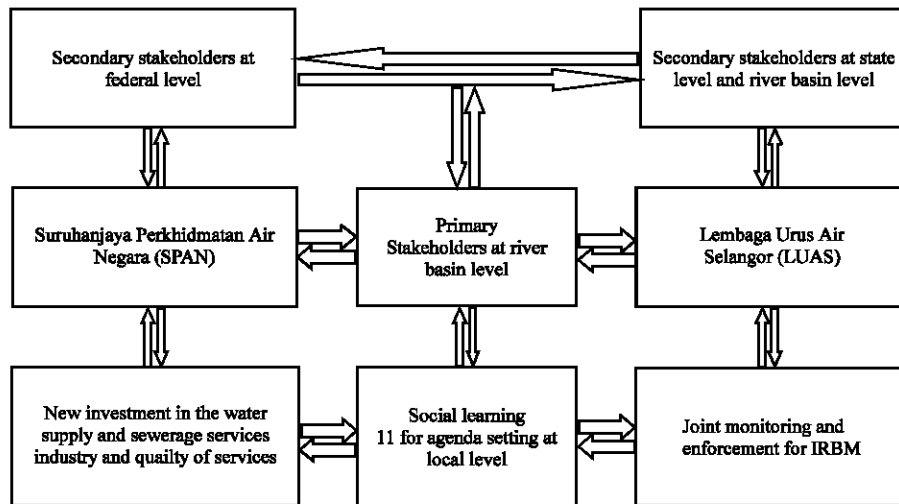


Fig. 4: Framework for social learning in LRB

their participation in decision making for successful IRBM implementation, stakeholder participation in decision making is also inevitable. But institutional analysis using IAD framework revealed that new action arena has been built but individual stakeholder participation in decision making for IRBM implementation at local level is still inadequate. It has created gap between policy planning and its implementation in LRB. However, institutional analysis also suggested that polycentric institutional arrangements under Federal administration are capable to coordinate and integrate river basin management by extending the scope for iterative learning processes that could address institutional challenges of IRBM implementation in LRB in due course.

Since IRBM implementation has been considered as a part of policy process, theoretical forecasting of policy future was become essential particularly for adoption of social learning for IRBM implementation in LRB. In its simplest form, regression analysis is a useful technique to estimate the linear relationships between independent and dependent variable with varying significance. Therefore, using stakeholder interview data, binary logit regression model and ordinal regression model analyses were carried out to find out present effect of influencing factors of IRBM implementation and outcome of present learning environment in study area. R^2 value for these model analyses were 0.41 and 0.27, respectively at 1% significance level. It was found that social learning could significantly influence IRBM implementation in the study area (Odd ratio for social learning was 17.11). It means that social learning is a significant factor to influence stakeholders for IRBM implementation in LRB.

Within the given context of LRB, as social learning was found to be a significant factor of IRBM implementation, it was deemed necessary to develop a framework which might be followed for its adoption. So an effort was made to develop above mentioned framework of social learning in LRB. In this framework stakeholders are divided into two categories to simplify the framework. Main focus of this framework is to give opportunities for participation of stakeholders in decision making. There is no doubt that each and every one of the society has his stake on water for use and misuse. So everybody must be involved in decision making on its appropriate use, protection, conservation and development.

CONCLUSION

In this study it was argued that IRBM implementation should not be considered as ad hoc strategy or discrete programme for sustainable development at river basin scale rather it should be considered as an iterative cycle of policy processes where individual stakeholder should have scope to participate in all the phases of policy process and thus learn. Social learning is now well

known approach and strategic tool that addresses many sustainable development challenges. Besides, understanding of this approach is improving particularly towards a sustainable world through forming institution capable to provide desired policy outcome. Results of this study revealed that there is opportunity to adopt social learning for IRBM implementation and thus overcome sustainable development challenges in LRB. Statistical analysis revealed that it is a significant factor to influence IRBM implementation in LRB through stakeholder engagement and learning.

It is now clear that a number of initiatives have already been undertaken by the Government of Malaysia and thus created new action arena which is conducive to decision making by engaging individual stakeholder for IRBM implementation in LRB. From action arena analysis, it was found that members of the complex hierarchic inter-organizational network are pro-active for IRBM implementation. So it can be said that existing polycentric institutional arrangements under Federal administration are capable to coordinate and integrate river basin management by extending the scope for iterative learning processes that could address institutional challenges of stakeholder participation in decision making. In this connection proposed framework of social learning may be followed. It is believed that adoption of social learning at local level as well as within organizations of the inter-organizational network for IRBM in LRB will largely complement this challenge and thus reduce uncertainty and complexity which are the outcomes of prevailing institutional arrangements. Gotong-Royong activity could be considered as local institution to immediately initiate social learning for IRBM in LRB under local context. Other local and religious institutions could also be utilized to initiate social learning. This social learning will determine future strategy and methods for decision making through stakeholder participation in IRBM implementation in LRB under local context.

RECOMMENDATIONS

However, it is strongly recommended that there should have further research on institutional performance analysis in the area. Only Malay community was interviewed. So other members of the community may be interviewed in future research to have complete and clear picture of the area. Finding of this study is envisaged to be useful to those who are concerned to strategize IRBM and sustainable development and further research on LRB and else where.

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