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Legal framing for achieving ‘good ecological status’ for Malaysian rivers: Are there lessons to be learned from the EU Water Framework Directive?

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Abstract

River degradation and loss of ecosystem services due to pollution and deforestation poses a great challenge for a holistic and sustainable river basin management. In Malaysia, about two third of its rivers are categorized as slightly polluted or polluted and this has led to the loss of ecosystem services in many of its river basin, notably in the rapidly developed Langat River Basin. The general historic legal responses to pollution control like imposing water quality standards and gazettal of protected areas seems to rectify the problem as it occurs and is unsustainable. In other parts of the world, there has been a rise in alternative framings of river basin management like the Ecosystem Services Approach (ESA), integrated river basin management (IRBM), catchment based and stakeholder led river management; and these are seen as the way forward for sustainable river basin management. The aim of this paper is to explore whether such framings can be implemented in Malaysia based on the current legal and federalism framework. It identifies the major causes and drivers of the polluted and poor state of Langat River and its tributaries and how might an alternative approach improve the situation. Towards this end, a comparative analysis is made with the EU Water Framework Directive (WFD) and its implementation in the Tweed UNESCO HELP Basin. Particularly, it explores the application of subsidiarity principle that allows decision making to be made by agencies closest to the problem within the basin. It concludes that redefining the roles of levels of government in IRBM and stakeholder engagement can speed up the process of reframing the Langat IRBM to reduce river pollution and enhance the ecosystem services of the basin.

Keywords: Integrated river basin management (IRBM), Langat River Basin, Pollution, Subsidiarity, Tweed River Basin, Water Framework Directive (WFD).

1. Introduction

Rivers provides various ecosystem services to both living and non-living things through climate regulation, air and water purifying and nutrient cycling (DEFRA, 2007). Other water bodies like oceans, wetlands and lakes support river ecosystem in various ways. Oceans, which occupies 97 percent of the world water bodies, provide important food production functions and regulates climate temperatures, while wetlands maintain natural cycles and provide food, shade and shelter for a wide range of species useful for provision of genetic resources and habitat regeneration of the river basin (Cech, 2005). As rivers have been utilized for social and economic development, little attention has been given to the needs of a river ecosystem, leading to loss and degradation of their ecosystem services (Corvalan et al. 2005). The rapidly developed Langat basin, which is located next to the Malaysian capital of Kuala Lumpur, has a population of over 1.7 million people and falls under the jurisdiction of four states or federal territories comprising of seven local councils. The relocation of administrative capital from Kuala Lumpur to Putrajaya and the development of Kuala Lumpur International Airport, all within the Langat River Basin, have witnessed the influx of housing, institutional and industries within the basin and has contributed to more waste and polluted river (Mokhtar et. al, 2010). These, together with illegal industries along the riverbanks and uncontrolled discharge of effluents and domestic sewage, have increased the pollution index level and led to the rise in coliform bacteria which created ecosystem dysfunction (Lee et al., 2006). Rivers can be conserved to their best ecological status when all levels of government and stakeholders cooperate to rehabilitate them to their original flow (Spray and Blackstock, 2013). This is not being achieved in the Langat basin as water agencies are not working in an integrated manner and stakeholders do not participate in the decision making process (Khalid et al, 2013). This paper analyses the challenges of a holistic and sustainable river basin management in Langat. Particularly, it explores the application of subsidiarity principle that allows decision making to be made by agencies closest to the problem within the basin. This paper presents a novel analysis of possible application of an alternative legal framing from the EU Water Framework Directives through the subsidiarity principle as applied in the Tweed River Basin in Scotland to the Langat River Basin. In the following, the background of study is presented, followed by research method, results and discussion.

1.1 Sustainable river basin management

Sustainable river basin management aims at ensuring a holistic and integrated management of a river basin which will improve the delivery of ecosystem services in the basin. Due to jurisdictional issues in any particular river basin, it must be supported by a legal framework which is adaptive to changes, trans-discipline and trans-governmental networks. The following discussion highlights the historic responses and alternative framing for sustainable river basin management.

1.1.1 Historic legal response

Legal responses towards river pollution and degradation in Malaysia have been mostly done in a piecemeal approach, i.e. by empowering relevant agencies to set and impose water quality standards or pollution control provisions. In most cases, the Department of Environment (DoE) sets the National Water Quality Standards while the Department of Health (DoH) sets the National Standards for Drinking Water Quality. Water samples are collected at the water quality monitoring stations and the findings are published in the yearly report (Zainudin, 2010).

In most instances, if a river reaches the polluted river status, the water treatment operator will be required to increase the treatment process to meet the relevant drinking water standard. When the river is badly polluted, the operator may need to shut down the treatment plant until actions are taken by enforcement agencies to stop the pollution or until the pollution is diluted by rain. The recent foul smell pollution in the Semenyih River, a tributary of the Langat River, caused the water treatment plant to shut down six times leading to a series of water disruptions affecting 1.6 million users (The Sun Daily, 2016).

Although quality standards have been set, the traditional response in pollution and environmental degradation cases are incident based and are unsustainable. It does not consider the impact on ecosystem, nor the services they provide. In addition, gazettal of forest and catchment areas may help but the areas can be de-gazetted by the state authority as and when needed. This cannot be

sustained and new approaches that enhance ecosystem protection must be used as alternative methods for sustainable river basin management.

1.1.2 The rise of alternative framing toward sustainable river basin management

In 2001, the United Nations Environmental Programme (UNEP) initiated the Millennium Ecosystem Assessment (MEA) to assess the consequences of ecosystem change on human well-being. It found that 60 percent of 24 ecosystem services, including provisions of clean water, food, forest products, flood control and provision of resources have been degraded to nearly two-third due, primarily to economic and social development (MEA, 2005). The report suggested that management interventions are needed to reverse ecosystem degradation; but knowing when and how to intervene requires substantial understanding of the ecological, economic and social needs (MEA, 2005) as well as improved governance.

Ecologists have proposed 12 Principles of Ecosystem Services Approach (ESA) which recognizes that resource management is a matter of societal choice and should be decentralised to the lowest appropriate level. It requires ecosystem to be managed within the limits of their functioning based on both scientific and local knowledge, innovations and practices (Secretariat of the CBD, 1999). In Malaysia, ESA has not been highlighted or mainstreamed in the environmental related policies. As such, stakeholders fail to appreciate the unique relationship between healthy rivers and surrounding ecosystem. This is particularly true for forested watersheds where loggings has created unprotected slopes leading to landslides and mud floods, disrupting healthy waterways (Hashim et al, 2015).

In another forum, the Global Water Partnership (GWP) introduced new concepts like Integrated Water Resources Management (IWRM) and Integrated River Basin Management (IRBM) to promote coordinated management and development of water, land and related resources to maximise the economic and social benefits and restore freshwater ecosystems (GWP, 2000). The GWP requires state governments to prepare the IWRM and IRBM plan to ensure clear strategies and better IWRM and IRBM implementation. Unfortunately due to the federalism structure of Malaysia, the IWRM plan was never implemented in Malaysia. This is because the federal agency,

the Department of Irrigation and Drainage, which is championing IWRM is merely a technical agency and has no jurisdiction in water resource management (Khalid et al. 2013).

Cook and Spray (2012) argued that both IWRM and ESA have similar challenges in the gap between conceptualisation and implementation. They recognize that both IWRM and ESA have progressed into similar concepts but give different importance on environmental health. Both, however, face serious implementation gaps as policy makers look to jump from one concept to another. Instead, they should stick to a concept and confront the challenges that arise with implementation, having a clear goal-setting agenda, and promoting participation to reduce conflict between society and ecology (Cook and Spray, 2012).

Elements of ESA has been incorporated in several river rehabilitation projects (Gilvear et al. 2013, Arthington et al, 2010, Palmer, et al. 2005). Nevertheless the physical success of each project depends upon accurate modelling of relationships between hydrological patterns, fluvial disturbance and ecological responses in rivers and floodplains (Arthington et al, 2010). Good understanding of river science will explain how a river network is degraded, the position of ecosystem services if no alteration has been made and how rehabilitation enhances ecosystem services (Gilvear et al. 2013). This can help identify ecosystem services providers and beneficiaries; and development of an accepted methodology for comparing benefits and trade-offs between ecosystem services (Spray et al. 2013).

2. Methodology

This is a qualitative study which involves content analysis of legal materials related to IRBM in the Langat River Basin in Malaysia and the Tweed River Basin in Scotland. In addition, semi-structured interviews were conducted with the local councils in the Langat River Basin to understand the problem faced by them in implementing IRBM. The findings are transcribed, coded and analysed through Atlas.ti data management software. The four interviewees are selected from all four local councils in Selangor as listed in Table 1. The study excluded council outside Selangor because they are not governed by the same laws and regulations. Interviewees were selected from the planning or the legal department, and the questions are mainly based on their understanding on

the IRBM concept, their capacity in ensuring IRBM implementation and their limitations if any. It is important to note that the interviews do not represent an empirical study as responses are only used to support the development of the IRBM framework in Langat based on the subsidiarity principle as in the Tweed River Basin.

3. Results and Discussion

3.1 Langat River Basin

The Langat River, the second longest river in the state of Selangor in Malaysia, originates from the Nuang Mountain within the Titiwangsa Range and ends at the Straits of Malacca. The Langat River Basin totals 2409 km² with four sub-basins; Langat, Semenyih, Labu and Beranang. The sub-basins falls under the jurisdiction of seven councils as listed in Table 1.

Table 1 Administrative Territories in Langat River Basin

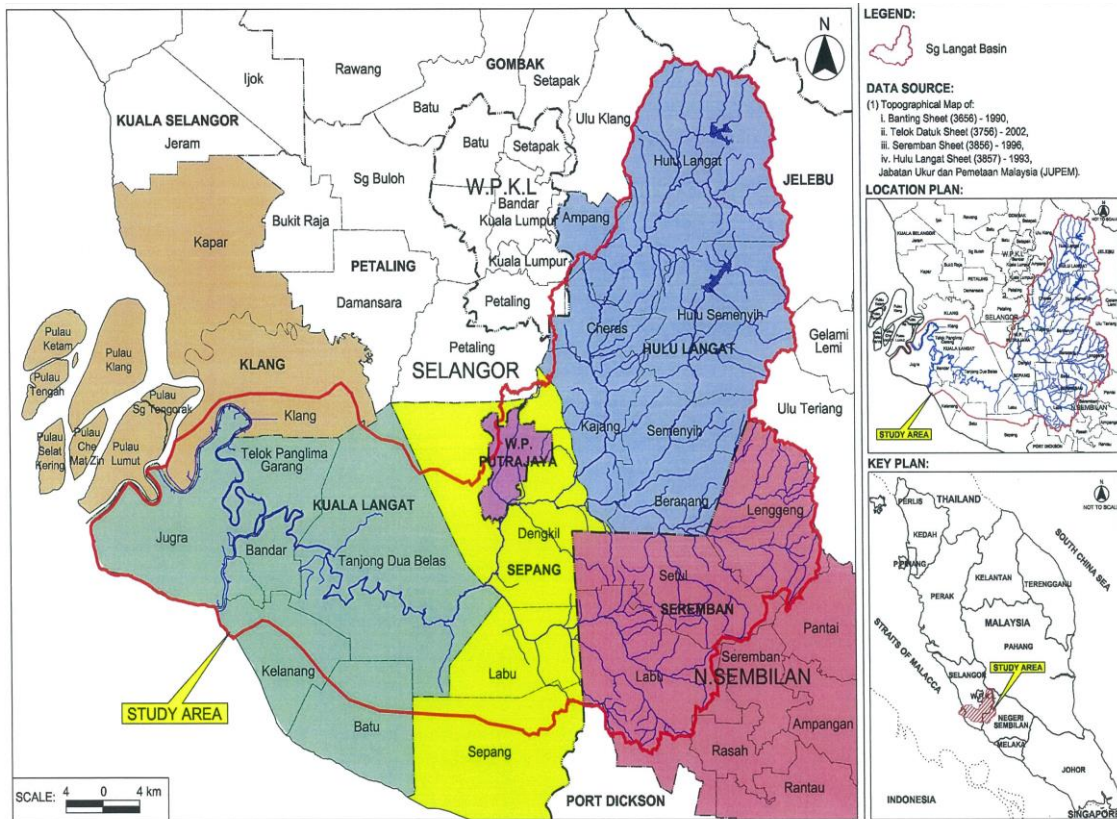
State	Local Government	Area (km ²)
Selangor (80 percent)	Kajang City Council	809.34
	Kuala Langat District Council	706.93
	Sepang City Council	333.25
	Klang City Council	71.87
Negeri Sembilan (18.3 percent)	Nilai City Council	445.12
FT Putrajaya (1.6 percent)	Putrajaya Corporation	39.21
FT Kuala Lumpur (0.1 percent)	Kuala Lumpur City Hall	3.67
	TOTAL AREA	2409.39

Source: modified from LUAS (2015)

When the federal government of Malaysia relocated its administration offices from Kuala Lumpur to Putrajaya, new townships have been rapidly developed in the mid Langat basin and stretched as far as the Kuala Lumpur International Airport (KLIA) in Sepang at the south of the basin. Total population in the basin has reached over 1.7 million people in 2015 and is expected to reach nearly

2 million by 2020; while total potable water demand has increased from 913.7 million liters per day (MLD) in 2010 to 1042.9 MLD in 2015 (LUAS, 2015). The development brought further stress to the already stressed basin as evidenced from flash flood, landslide and pollution cases (Abdullah and Zakaria, 2009). Although some part upstream is still in good ecological status with Class II of the water quality index, the Langat River is heavily polluted in the middle stretch downstream (Charlie 2010) (Fig. 1).

Fig. 1. Map of Langat River Basin



Source: LUAS (2015)

The Selangor Water Management Authority or locally known as Lembaga Urus Air Selangor (LUAS) was established under the LUAS Enactment 1998 and become the custodian of Langat and all river basins in the state of Selangor (LUAS, 2015). It is equipped with legislative power in IRBM and coordinates enforcement in solving pollution and other water problems. LUAS has recently published the Langat River Basin Management Plan 2015-2020 with four key areas pertinent to the Langat River Basin; Policy 1 to ensure sufficient water, Policy 2 to ensure clean

water, Policy 3 to reduce the risk of flooding, and Policy 4 on facilities for inland river navigation (LUAS, 2015). Successful implementation of the Plan requires good cooperation between all territorial agencies in the basin. Legally, as in Table 1, all four councils in Selangor will be under the direct control of LUAS. In Negeri Sembilan, the sub-basin Labu is supervised by the state’s water regulator while water issues in Putrajaya are dealt with by the Environment, Lake and Wetland Division of the Putrajaya Corporation. Unfortunately, Putrajaya is located in the middle of the basin, and most of the pollutants in Putrajaya Lake originate from tributaries under LUAS jurisdiction (Mokhtar et al, 2010).

3.1.1 Laws and Governance

The governance of Langat River Basin is complicated due to the Malaysian federalism framework. Under the Federal Constitution of Malaysia, water governance and jurisdiction is shared between the federal and the state government. The federal government through the Department of Irrigation and Drainage (DID) is responsible for developing water infrastructure, while the state government manages land and watershed (Mokhtar et al., 2012). The local government, which works within the purview of the state government, depends on DID to resolve local water problem and plays almost no role in the sector, in contrast to their list of duties in Table 2.

Table 2 IRBM Laws and Agencies in Langat River Basin

State agency (S) Federal agency (F)

Management	Statute	Agency
Pollution control	Environmental Quality Act 1974	D. of Environment (F)
	Drinking Water Quality Standard	D. of Health (F)
	Street, Drainage & Building Act 1974	Local government (S)
	Local Government Act 1976	Local government (S)
	LUAS Enactment 1998	LUAS (S)
	Water Services Industry Act 2006	Water Commissioner (F)

Catchment area	National Forestry Act 1984	D. of Forestry (S)
	LUAS Enactment 1998	LUAS (S)
	Local Government Act 1976	Local government (S)
Land Use	Land Conservation Act 1960	Land Office (S)
	Town & Country Planning Act 1976	Local government (S)
	Local Government Act 1976	Local Government (S)
Drainage	Drainage Works Act 1954	DID (F)
Flood Control	Ministerial Function Act 2008	DID (F)
	LUAS Enactment 1998	LUAS (S)
Water services	Water Services Industry Act 2006	Water Commissioner (F)

Source: Modified from Khalid et al. (2013)

Contrary to the popular belief that the DID is the key player in the water sector, the DID is merely a technical agency in drainage, irrigation and flood works; and it has no enforcement powers in IRBM. It is the local government that has a wide range of duty in IRBM, not only in pollution control, but also as the planning authority that can set conditions for development by the riverbanks. As such, it must only allow the least impact development near watershed and incorporate requirements of Langat IRBM plan when approving development plan.

3.1.2 Current state of Langat River

There is no legal requirement for rivers to be of good ecological status in Malaysia. The Water Quality Index (WQI) sets river status through a series of classes from Class I which is of pristine quality, to the worst Class V. Only Class I and Class IIA are equivalent to good ecological status as they consist of very sensitive or sensitive aquatic species. Class IIB however refers to rivers suitable for recreational use with body contact, while Class III refers to rivers suitable for tolerant

species and livestock drinking. The rest of the classes are badly polluted rivers with Class IV suitable for irrigation while Class V suits no purpose whatsoever (Zainudin, 2010).

On average, most of Malaysian rivers are either polluted or slightly polluted from suspended solids, biochemical oxygen demands (BoD) and ammoniac nitrogen (Department of Statistic, 2015). Although the state government has gazetted eleven forest reserves in the Langat River Basin, it only helps to keep a network of lentic and lotic habitat of 40 species of fish, much lower than other pristine basins, and Langat River remains between Class III to Class IV status (LUAS, 2015). The discharge of effluents from domestic sewage is the main contributor to the presence of coliform bacteria in the Langat River and leads to ecosystem dysfunction (Lee et al., 2006). In 2014, no river was recorded as clean or free from BoD (Department of Statistic, 2015). The existence of high BoD deprives the oxygen needs of other aquatic organisms and accelerates bacterial growth in the river (Lee et al. 2006). Other pollutions originate from industrial effluents, wastewater treatment plants and commercial areas (Juahir et al, 2010a). Thus, most rivers are not suitable for recreational use while extensive treatment is required for portable water supply.

3.1.3 Challenges for effective pollution control

The duty to control pollution is stipulated in several legislations. The Environmental Quality Act 1974 and its regulations can be regarded as the main law and is enforced by the Department of Environment (DoE). However, they are only applicable to point-source pollution such as agro-based and industrial discharges, livestock farming and sewages. It is the local government who has the duty to control non-point sources pollution from wet markets, restaurant and illegal settlements under the Local Government Act 1976, and they also have the power to maintain and keep in repair all surface and storm-water drains, culverts, gutters and watercourses under the Street, Drainage and Building Act 1974 (Khalid et al., 2013)

The demarcation of different types of pollution has created gaps and overlaps in duties and caused public uncertainty as to who is responsible if a river is polluted. Further, the DoE is a federal agency which was fully established to control pollution, while the local government has limited capacity to monitor all non-point source pollution in its locality (Mokhtar et al., 2010). In the recent

Semenyih foul smell pollution case, the DoE claimed no responsibility for the point-source pollution as the pollutant originated from illegal factories and blamed the local government for not controlling the development of illegal factories. The federal and the state government had eventually stepped in and ordered all agencies to enforce their laws albeit their ‘not my jurisdiction’ claims (The Sun Daily, 2016). This case exemplifies the non-integration of pollution control and enforcement in the Langat River Basin (Fig. 2).

Figure 2: Pollution in Semenyih Tributary



Source: The Mole (2016)

3.1.4 The role of local government in Langat IRBM

To understand the problems faced by the local government, four respondents from all four local councils in Selangor that form parts of the Langat River Basin were interviewed. The semi-structured interviews were based on questions pertaining to their roles and problems in IRBM and their understanding of other agencies’ roles in IRBM. For confidentiality purposes, the four respondents are identified only as Council A, B, C and D.

When asked about their legal duty in IRBM through pollution control, all councils were of the opinion that they have no direct legal obligation as they do not possess the legislative or

administrative power in IRBM. Council A, B and D were aware of their powers to enforce offences for river pollution under Part VIII of the Local Government Act 1976 and drainage management under Part III of the Street, Drainage and Building Act 1974. However, these are not their main duty since there are more urgent duties to carry out and other urgent local matters to attend to. In the case of Council D, one of its officers has to undertake various duties from monitoring development to health and disease control during an outbreak. It is interesting to note that Council C focuses on different legal provision which is section 19 of the Town and Country Planning Act 1976 that prohibit development without planning permission. However, Council C failed to prohibit the illegal factories that polluted the Semenyih River, arguing that they have limited staff with multi-task duties within their councils.

On the role of the local government as the local planning authority, all councils stressed that their decisions to allow development by the riverbanks are totally depended upon the technical report prepared by the technical agencies including the DID, DoE or LUAS. They explained that their councils will normally adopt these reports in the One Stop Centre (OSC) meeting. Recommendations from the technical agencies become the planning conditions to the developers and failure to comply with the conditions will jeopardize their chances to obtain the Certificate of Completion and Compliance (CCC). Nevertheless Council A stated that his council have allowed several development projects along the riverbanks irrespective of the technical agencies' disapproval. The reasons however were not revealed.

With respect to watershed management and flood prevention, the four councils will incorporate the DID's conditions to the developers to implement the Storm Water Management Manual or locally known as Manual Saliran Mesra Alam (MSMA). The manual details out strict requirement in ensuring minimum environmental impact like flood. However, Council B believes that DID, with huge manpower, needs to be more proactive in monitoring since mud flows are becoming common near sites uncovered with vegetation. In addition, irregular monitoring has led the developer to lease and install costly facility during inspection but dismantle it later. DID has also failed to ensure those developments provide sufficient landscaping to prevent pollution during and after the development project. Council D stated that in some cases, DID failed to maintain the retention pond required by MSMA and the neglected pond become a place for mosquito breeding.

The councils were also asked about developments that have impacted the ecosystem of the basin. Council A gave an example of a small area of a reserved forest in Selangor that was deforested to give way for a highway project and the developer had to find a new forest area to be designated as a new reserved forest. However, the new forest area did not serve the same ecosystem services as it is located far from the original forest. In another instance, Council B highlighted about a development project which diverted a river to increase the area for developing a shopping mall. The residents of surrounding area are now facing flash flood incidents as a result of the diversion. Council D did not give a specific example, but pointed out that the newly constructed highway into his council has increased the number of visitors as well as the waste produced. Some of the waste however has ended up in rivers, polluted them and disrupt the water ecosystem.

These findings illustrate several important points. First, the current management of the Langat River Basin is far from integrated with agencies do not fully understand their roles or the other parties' roles in IRBM. Second, all councils believe that they have no duties to ensure IRBM. In fact, they can regulate development along the riverbanks through the planning approval and development control. It is also apparent that they do not execute enforcement effectively and continue to argue on lack of personnel capacity and no dedicated division for pollution control. On this note, it is ironic to learn that the DID which is involved in infrastructural works, has hundreds of officers with various expertise in IRBM, but has no power on pollution control. Even LUAS which act as the river custodian has less than a hundred staff in 2016. The personnel imbalance requires an urgent appraisal so that adequate resources are channelled to the local government for better enforcement and effective IRBM implementation. By empowering the local government with knowledge on IRBM, they can do more to ensure sustainable development, lesser pollution and better ecosystem. It is thus pertinent to learn how IRBM can be effectively implemented by the local government in other jurisdiction, notably in Europe, which has a list of rivers of good ecological status.

3.2 European river basin management and the Water Framework Directive (WFD)

The Directive 2000/60/EC Establishing a Framework for the Community Action in the Field of Water Policy (EU, 2000), simply known as the WFD, is the guiding law for European water sector. It proposes for a single system of water management with the river basin as a geographical and hydrological unit in contrast to the traditional demarcation according to the administrative boundaries; and sets out general requirements for ecological protection to achieve the good ecological status (GES). Annex V of the WFD lays down the requirement for both surface and ground water for the member state to legislate if their water sources can be regarded as GES (Orfanidis et al., 2003).

River rehabilitation is a viable method to achieve GES as it improves river biodiversity and ecosystem services. Preamble 17 of the WFD provides that “an effective and coherent water policy must take account of the vulnerability of aquatic ecosystems located near the coast and estuaries or in gulfs or relatively closed seas, as their equilibrium is strongly influenced by the quality of inland waters flowing into them” (EU, 2000). Thus it is not surprising that many European countries allocated huge funds for river rehabilitation programs as a method to achieve GES (Schanze et al. 2004, Gilvear et al., 2013). Some of the projects were conducted through ESA to acquire multiple benefits from the river despite the fact that the WFD has never stipulated ESA as a tool for GES (Blackstock et al, 2015).

Critics doubt whether the requirement for GES should be regarded as a legal norm or merely a technical provision to fit the WFD ecological requirements. Baaner (2011) argues that the WFD approach in quantifying certain fixed biological elements is legally manageable, but highly contestable from an ecological perspective. Other critics like Moss (2008) and Howarth (2009) also claim that this objective as being over-ambitious. This is because, as Gilvear et al. (2013, p.31) put it, “hundreds of years of modifications in fluvial corridors and the catchments they drain have altered the nature of ecosystem services” and “the integrity of such systems has been diminished through human activity impacting on flow, quality and structure of water courses, from diffuse pollution and invasion by non-native species”.

3.2.1 Subsidiarity principle in the WFD

Alternative framings through IRBM or ESA stress on decentralisation of ecosystem management (Cook and Spray, 2012). This strengthens the call for societal involvement in IRBM to impart local knowledge and practices (Mandl, 2015). The requirement for decentralisation means that any decision shall be made at the lowest and most effective level of government that considers the needs of the locals (Schanze et al., 2004). The same requirement is also made under the WFD and subsidiarity principle determines the lowest and most effective level of government to make decision on certain water problems (Spray and Blackstock, 2013).

Initially, the subsidiarity principle is used in Europe as a mechanism for demarcating jurisdictions between the European Community (EC) and its member states. Under Article 3B of the Treaty on European Union (Maastricht Text) (EU, 1992), subsidiarity connotes that the EC shall take action if the objectives of the proposed action cannot be sufficiently achieved by the Member States. The key element in applying subsidiarity principle is that the EC can only deal with a situation if it cannot be done effectively at much lower level. Article 12 WFD specifically employs this principle as it requires matters that cannot be dealt at the member state level to be reported to the EC for further action.

The subsidiarity principle is applied under Article 3 WFD which calls for coordination of administrative arrangements within a river basin district. Article 3(3) WFD in particular calls member state to identify appropriate competent authority to apply the WFD in a river basin district within its territory while Article 3(5) WFD indicates that when a river basin covers the territory of more than one Member State it will be regarded as an international river basin district. Subsidiarity becomes a solving mechanism under Article 12 WFD as member states will only refer to the EC to deal with issues that cannot be solved at the national level while Article 14 WFD calls for public participation in developing and reviewing the IRBM plan (EU, 2000).

The requirement for public participation under Article 14 WFD implies bottom-up water governance and calls for devolution or delegation of power to the lower levels of government (Rouillard and Spray, 2016). Preamble 14 WFD emphasizes on close cooperation and coherent action between the EC, Member States, local government and public (EU, 2000). Mauerhofer et

al. (2013) explains that the WFD exemplifies the fact that present ecosystem governance must involve stakeholders especially when rural ecosystem is undergoing robust changes. Schanze et al. (2004) believe that public participation through meetings can inform, consult and involve people in the planning process as well as to mediate interests of diverse stakeholders. As an illustration, Mandl (2015) states that the WFD assist in Danube River IRBM when it is delivered through a bottom up approach and the public participated in the annual river festival, Danube Day, Danube Watch or the teacher's kit Danube Box.

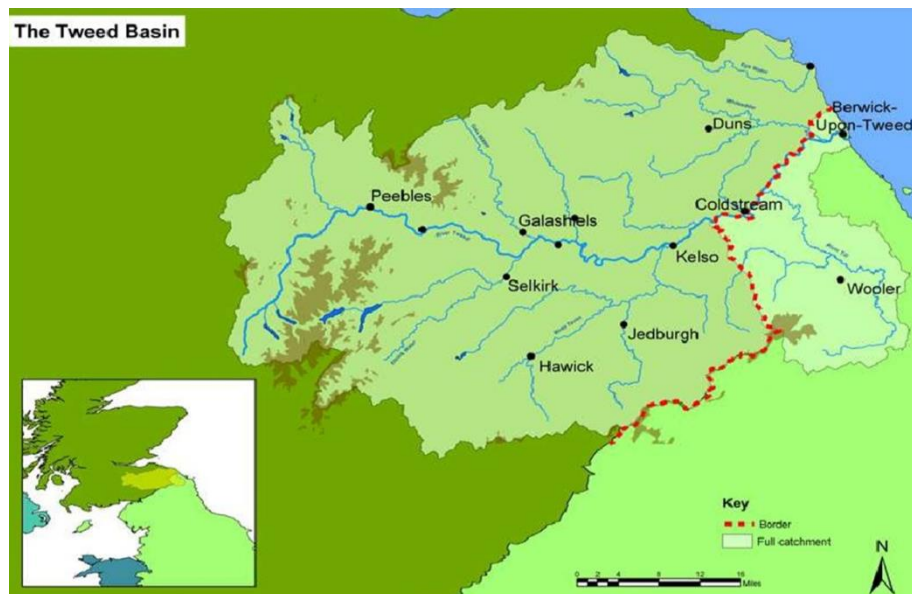
Although the WFD has been commended for promoting integration and gearing towards establishing the river basin as a single system of water unit, Wilby et al. (2006) submit that the WFD does not elaborate on the climate change impact on a river basin although it may affect the parameters influencing achievement of GES. As such, they recommend that the EC should develop a regional adaptation policy to be incorporated in the river basin management plan. Member states through Article 12 WFD can refer to the Commission for further guidelines on adaptation strategies when they review their river basin management plan. The 2012 flood in England and other European cities call for more adaptation strategies to increase the adaptive capacity of the general public. The Directive 2007/60/EC on the assessment and management of flood risks (EU, 2007) or the Flood Directive aims to solve this through the subsidiarity principle since it includes the local government as an important player in flood risk management.

3.2.2 Tweed River Basin, subsidiarity and GES

The application of the subsidiarity principle in achieving rivers of GES can be seen in the Tweed River Basin in Scotland. The basin is approximately 160km long and Tweed River is the second longest river in Scotland. It is a trans-boundary basin, with 16% in England, the river forming the national boundary in the lower reaches below Kelso in the Borders Region in Scotland and Berwick-upon-Tweed in England. It is one of the least polluted rivers in the United Kingdom and is designated as a Special Area for Conservation by the EU as the most species-rich example, by far, of a river with *Ranunculus* in Scotland, with high ecological diversity including Atlantic salmon and otter. Its catchment area is 5000 km² with some 680 km² in England. (Fig. 3).

Like many river systems in the world, the Tweed underwent a degradation process and habitat loss in the early 19th century due to industrialisation, urbanisation and agricultural intensification. One of its tributaries, the Eddleston Water, had been straightened and shortened to pave way for a new toll road between Peebles and Edinburgh, as well as subsequent improvements to land drainage and made into canals to improve irrigation (Gilvear et al., 2013). Since 2009, a local stakeholder partnership, led by the participative catchment NGO, Tweed Forum and supported by Scottish Government have been working to restore the Eddleston Water as part of a long-term study of the effectiveness of catchment measures to reduce flood risks. This has included re-meandering the river to increase channel heterogeneity, reducing flood flow velocities and increasing hydraulic habitat diversity; while buffer zone creation and riparian planting improve riparian habitat, reduce soil and bank erosion and increase interception of nutrients and organic matter (Gilvear et al., 2013).

Figure 3 Map of Tweed River Basin



Source: Tweed Forum, 2014

Pursuant to the WFD, the Scottish Parliament passed the Water Environment and Water Services (Scotland) Act 2003. The Scottish Environmental Protection Agency (SEPA) has been entrusted to develop better ways of protecting and improving the condition of Scotland river basin district towards achieving GES. Concern over increasing flood risk due to, among other reasons climate

change has also brought subsidiarity towards localism in Scotland’s new flood risk management. The EU Flood Directive 2007 (EU, 2007) was adopted through the Flood Risk Management (Scotland) Act 2009. The new law requires SEPA, Scottish Water, local government and other responsible bodies to deliver flood risk management in partnership based on the river basin approach. This is the first time such flood risk management power is given to the local government and it corresponds with the principle of subsidiarity because local government operates at the closest level to deal with local flood issues. This new requirement will help reduce the risk of flooding as the local government must prepare and implement flood risk management plan, including when considering any development in flood plain areas. Whether or not the local government is the most effective level to resolve flood issues will depend on their ability to deliver and that depends on adequate financial and technical provision to run expensive flood risk program. Despite the decentralisation initiative, financial dependency may end up as another form of centralisation (Pike et al., 2016). However, the 2009 Act has limited the number of agencies in IRBM and redefined their roles as in Table 3.

Table 3 IRBM Laws and Agencies in Tweed River Basin

Management	Statute	Agency
River Basin (including land use)	Water Environment and Water Services (Scotland) 2003 (incorporate the Water Framework Directives 2000)	SEPA Local government Scottish Water
Flood	Flood Risk Management (Scotland) Act 2009 (incorporate the Flood Directive 2007)	SEPA Local government Scottish Water
Water services	Water Industry (Scotland) 2002 (incorporate Drinking Water Directive 1998)	Scottish Water Drinking Water Quality Regulator

Source: SEPA (2012)

3.2.3 Rise of the stakeholder engagement process

An important component of water governance in Tweed is the right to participate in decision making process. This is legally binding in Europe under the Aarhus Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matter 1998 (EU, 1998). Article 4 of the Aarhus Convention requires public authorities to make information available to the public within a reasonable time while Article 5 places obligations on public authorities to possess, update and disseminate environmental information relevant to their functions. Articles 6-8 provide that public authority must ensure that affected public to comment on planned projects and laws likely to affect the environment (EU, 1998).

Following the Aarhus Convention and subsidiarity principle, the general public becomes the key player in IRBM. This is relevant to a trans-boundary river like the Tweed. At the community level, the Tweed Forum was established in 1991 to promote the sustainable use of the whole of the Tweed catchment through holistic and integrated management and planning (Tweed Forum, 2014). Specialised sub-groups within the forum, like the Riverworks Working Group, help streamline overlapping regulation, improve inter-department integration and provide inputs for the 2003 Tweed Catchment Management Plan and the WFD River Basin Management Plan (Rouillard and Spray, 2016). After 20 years of continuous work, promoting and enhancing the local's knowledge on the catchment, Tweed Forum has become a trusted intermediary between the community, the government and its regulatory agencies for river improvement and flood risk reduction. It provides an example where education and information flow can help creates environmental awareness and effective participation. This is proven successful in a river rehabilitation project which involved many stakeholders in Tweed which has now improved the ecosystem services in the Eddleston Water as shown in Table 4.

Table 4 Ecosystem Benefits from River Rehabilitation in Eddelston Water

Rehabilitation Measures	Ecosystem Benefits
Re-meandering	Increase channel heterogeneity Increase hydraulic habitat diversity and suitability Reduce flood flow velocities
Flood embankment removal	Enhance habitat availability

	Increase water storage Reduce flood flow velocities
Floodplain forest	Enhance habitat availability Increase water storage and create nutrient uptake Reduce flood flow velocities
Buffer zone creation and riparian planting	Improve riparian habitat Reduce soil and bank erosion Create nutrient uptake and input organic matter
Woody debris reintroduction	Increase habitat heterogeneity Increased water storage Reduce flood flow velocities
Weir removal	Reinstate sediment flux Reconnect isolated aquatic habitats Allow fish passage up and downstream

Source: Modified from Gilvear et al. (2013)

It is observed that multiple benefits can be derived from a single river rehabilitation program. In improving ecosystem services, the project both acts as natural flood mitigation (since four of the six measures have contributed to lower flood flow velocity) and habitat restoration to help achieve GES. This also demonstrates the dynamic of water ecosystem and the impact of diversion on the ecosystem and its services.

3.3 How might the WFD experience help reframing the Malaysian situation?

Subsidiarity principle as required by the WFD allows decision making to be made by the most effective level of government closest to the water problem. The successful Tweed story illustrates the importance of local government and all stakeholders in IRBM through rehabilitation projects that increase the ecosystem benefits of the basin. This echoes the ESA Principle that resources management is a matter of societal choices because they understand the ecosystem’s structure and the limits of their functions based on the local knowledge, innovations and practices. Thus, subsidiarity allows decision to be made at the lowest level and promotes the combination of bottom-up and top-down natural resources governance.

A quick comparison between Table 2 and Table 3 exemplifies the complex relationship between multiple agencies in the Langat River Basin but a simpler framework in the Tweed with shared responsibility between the local government, SEPA and Scottish Water. The prevalent misconception that the local government has no role in IRBM has hindered local government to play their roles in Langat. This may be due to the centralised federalism system in Malaysia where the federal agency like the DID plays the dominant role in the sector. Hence the federal government must redefine the role of agencies based on the subsidiarity principle and decide whether the DID, DoE, LUAS or local government is the closest and most effective level to decide for the Langat River Basin based on the present legal framework.

The WFD emphasises on mixing the top-down and bottom-up water governance through effective public participation. In Malaysia, efforts have been made towards this. For instance, the Eighth Malaysian Plan encourages participation in the water sector through smart partnership between the local government and non-governmental organizations (NGOs). The Water Services Industry Act 2006 also encourages participation and consultation in planning and development process through the Water Forum; while the National Water Resources Policy 2012 stresses on collaborative partnership in the sector. However, there is generally lack of good response by Malaysian due to lack of knowledge, awareness and experience in this matter.

It is vital that proactive steps are taken to educate Malaysian to use, conserve and manage river basin in a sustainable manner. River Basin Council or Citizen Advisory Committee as proposed by Tan and Mokhtar (2009) can organize workshops to increase awareness and change public attitude towards IRBM. This supports collaborative decision making of all stakeholders, increase information exchange and improved decision support tools (Elfithri et al. 2002). Nevertheless, development approved by the technical agencies may not consider public's opinion during the decision making process. There is also no legal requirement for compulsory and effective participation as required under the WFD and the Aarhus Convention in Europe.

The application of subsidiarity principle in the WFD mandates the local government to play more role in IRBM and make informed decision on the local water matters as seen in the Tweed. The

principle also requires references to be made to the European Commission if a matter cannot be solved by the lower levels. Within this setting, the arrangement of what each level of government should do in European IRBM can be simplified in Table 5.

Table 5 Subsidiarity and Devolution of Power under WFD

European Commission	<ul style="list-style-type: none"> • Harmonizes European water sector • Sets GES in IRBM plan
Member States	<ul style="list-style-type: none"> • Adopts European standards • Integrates water and land development to meet GES • Coordinates regional flood management
Local Government	<ul style="list-style-type: none"> • Ensures effective participation • Incorporates public feedback in IRBM plan • Manages flood risk in development plan

Subsidiarity principle works in the European multi-level governance as it allows the closest and most effective level of government to make decision in the sector. Thus it can be argued that subsidiarity should also works in the federalised and multi-level water governance in Malaysia. However, since the local councillors are not elected in Malaysia, devolution of power is unsuitable as it raises the issue of accountability of the unelected councillors. Instead, the federal government can delegate their administrative power to the lower levels for better IRBM implementation through effective public participation. Fischman (2005) explains that cooperation between the central and lower governments is useful in natural resources management as it enables a holistic ecological approach to environmental ills. However, this will not be achieved if the central government continues to dominate the decision making process. Although the central and political influence is an inevitable consequence of economic development and market integration (Johnston, 2003) a policy that assigns appropriate roles to lower levels of government is needed for better climate change adaptation (Glicksman, 2010).

Although subsidiarity generally works towards decentralization, it needs to be balanced with the traditional top down governance to achieve a holistic IRBM. In one study, Huntgens et al. (2011)

compare and analyse eight water management regimes in Europe, Africa and Asia and found that top-down governance structure is very much relevant to facilitate participatory processes, set standards, capacity building, conflict resolution and provide information that is not available at the grass-roots level. This corresponds with the view of Clark and Dickson (2003) that multi-level governance enables actions to be done at lower levels while reserving certain capacity to a higher level to allow collective action. It involves all levels working together to establish local goals with the central government provides infrastructural support, assists local units to better perform delegated functions and facilitates regional coordination (Clark and Dickson, 2003).

Subsidiarity also aims to protect the independence and legislative authority of the local government in dealing with local river basin. Nonetheless, they requires technical and financial support in deliberating and delivering correct decisions. A study by the International Monetary Fund (2002) shows a variation in total public expenditure of the local authorities in some federal system and it raises concern on their ability to cope with power devolution. Similarly, Zakaria (2007) believes that although the locals know best and is the closest level to the water problem, they need enough funding and support from the higher levels. This gives the opportunity for cooperative federalism to work using the carrot and stick approach. The federal government will only fund and set standards for the lower levels to implement, and focuses on other important national duties.

Redefining the roles of multiple agencies in the Malaysian water sector shall reduce the normal tendencies of gaps and overlaps in the sector. Water governance through centralised government is unsustainable in the context of climate change as local problems are becoming more complex and require a more localised problem solving. Through subsidiarity the federal government can redefine different roles for the lower levels in IRBM so that the correct amount of technical and financial capacity is channelled to them. This should not be done through devolution, but rather through delegation of executive and administrative powers. As such, subsidiarity can help to reframe the Malaysian water sector and redefine the role of different levels of government in Langat River Basin and other river basins in Malaysia as suggested in Table 6.

Table 6 Subsidiarity and Delegation of Power in Malaysian IRBM

Federal Government	<ul style="list-style-type: none"> • Policy making on climate change • Infrastructural work on climate change mitigation • Mainstreaming climate change in national agenda
State Government	<ul style="list-style-type: none"> • Integrates water and land development • Implements national policy at state level • Coordinates river basin management
Local Government	<ul style="list-style-type: none"> • Prioritises low impact or green development • Promotes stakeholder participation • Enforces non-point source pollution control

4. Conclusion

Subsidiarity allows the appropriate level of government to decide on water problem closest to their level. It requires transparency and information flow for effective decision making process, which is not apparent in the context of Malaysian centralised federalism. Steps must be taken to include collaborative decision making in IRBM to improve the river quality in Malaysia and the government must help redefine the roles that should be played by multiple agencies to avoid any implementation gap. The Tweed model can be used to promote a more holistic management by engaging local government and communities in Langat IRBM. In fact, the Malaysian federalism structure supports subsidiarity as it allows implementation at the lower levels which is closer to the problem and provide the higher level more time and capacity to focus on other duties of national importance. As Malaysia learns the experience of the Tweed, it must also appreciate the fact that different structures and cultures may have contributed to the successfulness of their water sectors. In the case of Europe, where many rivers have achieved the GES as required by the WFD, efforts toward this success have started years or even decades ago. In addition, the political maturity in developed countries has simplified cooperation in the water sector while new concepts like IRBM have been mainstreamed into the political and administrative process. This ensures better allocation or reallocation of resources to the most effective level of government closest to the water problem, be that the central, state or local government. Effective water governance also

facilitates stakeholder participations like the Tweed Forum in the management and the decision making process of a river basin so as to improve the ecosystem and its services. As such local government in Malaysia, being the closest level of government to the local water problem, should be equipped with sufficient resources to ensure effective public participation in the water sector. They must not be seen as merely the implementation body of the federal and state governments' policies but must be seen as an important partner in IRBM. Cooperation of all levels will also lead to a sustainable river basin management that respects jurisdictional issues and understands the relationship between the society, their rivers and the entire ecosystem.

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