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"Entry Points" in Integrating Climate Risk and Adaptation Asessment into Development Planning: Reflections from Semarang and Tarakan City, Indonesia

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ABSTRACT

One of the most challenging issues in adapting to the possible impact of climate change is whether government able to find and set an appropriate and balance policy between proposed adaptation actions and other development agenda; moreover about how to translate scientific findings into suitable policy. This paper aims to share experience from two cities in Indonesia which are trying to integrate the process and result of climate risk and adaptation assessment (scientific process) into the city spatial and non-spatial development planning system, i.e. Semarang City in Java Island and Tarakan City in Kalimantan Island.

The experiences being shared here came from the involvement of authors in the action research for Tarakan City which aims to integrate adaptation actions to development plan and planning studio for Semarang Municipality which develops Local Action Plan on Climate Change Adaptation. By far, it can be concluded that local government on both cities still not entirely sure on considering the impact of climate change, even more there are still doubts and misconception about the climate change adaptation concept itself. However, basically local governments are open and welcome the rationale for integrating climate risk and adaptation assessment into their spatial and non-spatial development plan. In addition, each city has their own way to manage the interaction between scientific and policy realm; i.e. in Semarang City through mechanism called Shared Learning Dialogue (SLD) and in Tarakan City through closed collaborative works between researcher and government officials. Both strengths and weakness of each approach will be elaborated further in this paper. Finally, this paper will offer the entry points to integrate climate change adaptation into spatial and non-spatial plan development system in Indonesia, based on reflections from both cases, as well as how it may function elsewhere.

I. INTRODUCTION

Government of Indonesia (GoI) has acknowledged climate change as one of the most challenging issues that may affect the development of the country. Aside of mitigation efforts for meeting the target of Greenhouse Gases (GHGs) reduction up to 26% by 2020[1], GoI also emphasized more concerns over adaptation effort to climate change, since many of Indonesian area already and will suffer further from its impact. At national level, adaptation policy to climate change at least already covered within two major policies; i.e. Indonesian Climate Change Sectoral Roadmap (ICCSR) and Yellow Book. From both documents it has been stated that strategies and possible adaptation actions should be integrated into development systems.

In Indonesia, there are two major development systems; i.e. non spatial planning development system which regulated by Law 25/2004 on Development System and spatial development system which regulated by Law 26/2007 on spatial planning. The non spatial development system produced three types of document plan; i.e. Long Term Development Plan (RPJP/25 years), Medium Term Development Plan (RPJM/5 years), and Annual Development Plan (RKP/1 year). Each type and level of government agencies produced equivalent type of plans, for example local government as a whole and for each agency. On the other hand, spatial planning system distinguished two types of plans; i.e. General Spatial Plan (RTRW) and Detailed Spatial Plan (RDTR). Those types of spatial plans basically, once it is legalized, thus operable up to 25 years in which equal to the period of RPJP; however each plan at least should be reviewed 5 years a time in which equal to the period of RPJM. In addition, each plan should be able to become one of the main references in establishing RKP as an annual development plan. To this stage, it can be seen that spatial and non spatial plan already have their connection to ensure comprehensive way of development.

The ICCSR proposed that each area should have its own regional risk assessment in which its result contains strategies and adaptation action to be mainstreamed into the local RPJM, thus creating space for specific or co-benefited adaptation actions within the development agenda (RKP). In this sense, local government will be eligible to request for funding or other resources from central government, or even more from the international donor/institutions, in order to conduct adaptation projects.

On the other hand, basically the spatial development system did not literally mandating adaption actions from the climate change. However, the system is mandating each type of plan to have section about disaster mitigation. In this sense, there were some climate-related types of disaster, e.g. flood and storm surge, thus climate risk and adaptation has its entry point to be integrated. In addition, after those two laws being legalized, there was another law being enacted, which is Law 32/2009 on Environmental Protection and Management. Within this law, there are two mandatory

[1] President Yudhoyono of Indonesia at COP 15-Coppenhagen, 2009.

documents should be produced; i.e. Environmental Protection and Management Plan (RPPLH) and Strategic Environmental Assessment (KLHS). The Law strictly pointed out that local government should comprehend output from both RPPLH and KLHS into the spatial plan (RTRW). Therefore, it was clear that in term of regulation, current arrangement have outlined possibility and endorsement for mainstreaming climate change adaptation into development system. However, it does not mean that such integration may come and being implemented automatically.

The discourse about how to integrate climate change issue into development system was concern of many development actors. Fuchs (2007) noted that the substantial barriers to implement climate change adaptation for cities are lack of awareness, distracting immediacy of other problems, budgetary constraints, and governance issues; thus implementation of climate risk management in planning and policy must be given high priority for meeting the challenges came from climate change and urban growth. From many documented discourses, principles, and academic publication, there were several general ideas that can be drawn about this topic. OECD (2009) defines that at least there are three principles in climate change integration into development; i.e. identification of appropriate level, identification of entry points, and applying climate lens.

On the other hand, Hahn et al (2010) suggested important remarks in doing so, consists of principles such as: a) process is key, b) forms follow function, and c) mix of perspectives for integrating climate change adaptation into development system. The term "entry point" basically emphasized that climate change adaptations are still questionable to many development actors, whether to be one of the main considerations or not. This made the principle "process is a key" was equally important to the result of climate change adaptation. In this sense, as a process, climate change adaptation should be consists of activities ranging from substantial maters (for instance strong scientific basis and deep understanding on how it would affect the development – multi perspective) as well as communicative matters, such as education for policy maker and involvement of stakeholder. In addition, it is also strongly related with the principle of "applying climate lens"; in which emphasized the importance of measurement of plausible climate change impacts and its considerations to development planning. In the end, output from climate risk and adaptation assessment should be integrated within "appropriate level"; i.e. refers to both types of development planning document and the level of government; i.e. whether it would be at central level, provincial level, city/regency level, or local. For instance, Suroso et al (2008) proposed three major levels of climate risk assessment studies, mostly practiced in Indonesia, given in the table below.

Table 1 Type of Climate Risk and Adaptation Assessment

Scale	Scope	Outcome	Data and Analysis	Accuracy	Finance	Example of Assessment in Indonesia
Macro	National	Adaptation Policy	Qualitative	Low	Low	Indonesian Climate Change Sectoral Roadmap (ICCSR)
Meso	Provincial	Adaptation Strategy	Qualitative - Quantitative	Medium	Medium	South Sumatra, Nusa Tenggara Barat, Greater Malang CRAA
Micro	Local	Adaptation Actions	Quantitative	High	High	Semarang City, Bandar Lampung City, Tarakan City

Source: Suroso et al (2008) modified from Messner (2005)

In a more detailed manner, about interaction between researcher and policy maker, Larsen et al (2012) tried to formulate framework in facilitating policy and researcher dialogue in climate change adaptation. By studying three cases in Sweden, Canada, and Indonesia they highlighted that the dominant approach in climate change adaptation mainstreaming is an 'upscaling' model in which case study research being used to foster local adaptation or national level policy through a so called 'sense-making perspective'. Therefore, as a result of their analysis, methodological choices shape how case study research works at the interface between planned (steered/regulatory policy) and self-organized adaptation of stakeholders (non-coercive policy). In other dimension, this can also be use as a means to detect the meaning of adaptation planning and action perceived by actors whom engaged

To this end, this paper aims to share experience from two cities in Indonesia which are trying to integrate the process and result of climate risk assessment and adaptation formulation into the city spatial and non spatial development system; i.e. specifically about the way science and policy interact.. In general, several remarks on integrating climate risk and adaptation assessment given above was being used to draw insight from experiences in both cities. Most of the data came from primary and secondary sources in relation with Author involvement on project and study in both cities.

II. CLIMATE CHANGE IMPACT PROJECTION FOR SEMARANG AND TARAKAN CITY

The case studies that being reviewed in this paper are Semarang and Tarakan City; both have been acknowledge as cities that are prone to negative impact of climate change in Asia (Fuchs, 2010), as it can be seen in the figure below. The figure also shows that Semarang City was the example of big city and Tarakan is the example of the small one, both prone to the impact of climate change in coastal area. The changing climate towards both cities already being indicated, that it would resulted in multi-dimensional impact for various development sectors. For Semarang City, the changing climate basically influences the occurrence of extreme events, rainfall pattern, temperature, and sea level rise (Mercy Corps, 2010). There are two common extreme events; i.e. flood and drought. Based on study by Mercy Corps, flood mostly occurred in locations within low elevations, i.e. coastal area or basins.

It was already felt that the climate change impact disturb the development within their coastal area, water provision, and probably the health sector (Mercy Corps, 2011). As for Tarakan City, it was similarly being inferred that the impact of climate change would affect their coastal area, water provision, flood occurrence, landslide, and several diseases such as dengue fever, malaria, and diarrhea (Suroso et al, 2011). As focus of this paper, the coastal sector is the selected main sector so that the comparison of experiences in both cities can be done proportionally. As of for the time frame it is until 2030, in which also the same as the end of both Semarang and Tarakan City spatial plan.

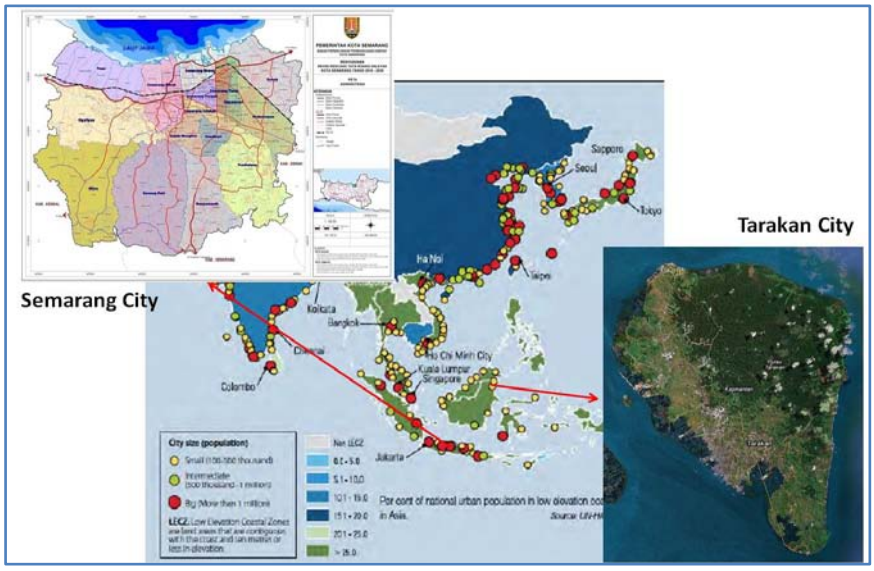

Figure 1 Study Area: Semarang and Tarakan City

Source: Fuchs (2010), RTRW Semarang 2010 – 2030, Suroso et al (2011)

2.1 Semarang Situation

Semarang coastal area is located in the northern part of Central Java Province in Indonesia between latitudes 6.93^{o} – 7.13^{o} latitude and 110.27^{o} – 110.50^{o} longitude with total area of approximately 373.7 km2. The coastal area of Semarang City consists of 4 districts (Genuk District, Tugu District, North Semarang District, and West Semarang District) which was the location for 398,360 inhabitants and have the total area up to 9,188 Ha. There were already several assessments on sea level rise in Semarang City as an impact to climate change, measured the rate of SLR as well as the inundated area; i.e. Ministry of Marine Affairs and Fisheries (2009) mentioned that the rate of SLR is 7.8 – 8 mm/year; while Siwi et al (2010) mentioned 2.67 – 6.6 mm/year. However, even though the rate of SLR in Semarang was actually quite low, but the level of risk and the projected inundation area will be greater since the coastal area also experiencing land subsidence.

The rate of the land subsidence itself was more than 0.2 m/year in several sub districts in north Semarang.. Marfai and King (2007) forecasted results of land subsidence in Semarang, with assumption that the rate of land subsidence is linear and there will be no protection action being taken, Sinking area is predicted to gradually increase from 362 ha in the year 2010 to 1,377.5 ha in the year 2015 and up to 2,227 ha in the year 2020 (Marfai and King, 2007). In this sense, inundation area basically resulted by the interaction of SLR and the existed built area. The built area itself was a results of the development characterized as being centralized in the northern coastal and low-lying areas, which led to rapid urbanization and environmental problems such as coastal erosion and sedimentation, over-exploitation of ground water resources, land subsidence, and tidal inundation in 1990s (Marfai and King, 2007).

The total affected area for 120 cm of inundation model is about 527.8, 775.7, 1,320.5, and 1943.5 ha for agricultural and plantation areas; bare land, beach and yard; build up area; and fishpond area, respectively (Marfai and King, 2007). Meanwhile the total affected area for 180 cm of inundation model is about 712.5, 930.8, 1716.6, and 2235.0 Ha for agricultural and plantation areas; bare land, beach and yard; build up area; and fishpond area, respectively. With the assumption of zero-growth population in the future years, more than 148,000 people would be suffering from

inundation. The most vulnerable areas are Tanjung Mas, Bandarharjo, Panggung Lor, Kuningan and Kemijen with populations of 28,414; 18,946; 14,295; 13,189; and 13,053 people, respectively.

On the other hand, Miladan (2009) also assessed probable risk of SLR in Semarang City until year 2030, resulting a projection of inundated area in Semarang City that possibly reach 2.672,21 Ha (47,55%); i.e. 1.689,11 occurred in Tugu District, 798,23 Ha in North Semarang District, 896,531 Ha in West Semarang, and 801,948 Ha in Genuk District. Miladan (2009) also assessed how the SLR would affect to the disappearance of several land use in term of economic activities. It was mentioned that 2.130,34 Ha of business / production area would be disappeared, 279.11 Ha of services area, and 203.52 Ha for the rest built areas.

2.2 Tarakan Situation

Tarakan City is an island-city, located in 3°.19'-3°.20' N and 117°.34'-117°.38' E, consists of the main land and water area with total area approximately 25,080 Ha. Tarakan shows a considerable diversity of coastal morphology, exposures, and ecosystems. The city contains 4 district and 21 sub districts (equivalent to village). In 2008, there were 176,168 inhabitants in Tarakan City in which almost 80% of Tarakan's population are living in the coastal area with less than 2 km inland and highly concentrated on the southwest of the island where the economic and governmental activities are concentrated.

The land utilization in coastal zone of Tarakan is very different in each side of the city. For instance, the area in the south-western coast is intensively developed, i.e. urban areas, port systems, and industry, fishing and oil exploitation activities. On the other hand, the eastern and northern coasts have a low population density, green open space, city forest, as well as several important infrastructures, such as oil refinery and seaside tourism resorts. Therefore, the pattern of vulnerability is different in each coast of Tarakan City.

To generate the hazard of sea level rise for Tarakan City, Latief et al (2011) used scenario comprises of extreme events, La Nina, and Storm Surge, in which based on SRES-A1B Scenario. From the hazard analysis for baseline and projection situation, it is known that the sea level rise in Tarakan City may reach 269.8 cm in 2030 from initial height 255.1 cm in 2010.

Given the hazard and vulnerability analysis result, thus the risk for Tarakan City was being drawn. It is being known that East Tarakan District's coastal line, which stretch 46.27 km, has its coastline placed at the high and very high risk towards the SLR (Latief et al, 2011). Several vulnerability factors that caused this level of risk were the existed and planned viral infrastructures, such as military facility, oil refinery, and mining area, on the other hand there were already several highly populated settlements.

On the other hand, coastline in West Tarakan District is facing greater challenge as the size area having very-high and high level of risk is bigger compare to the east coast. In addition, the level of populated area in West Tarakan shoreline is denser, since it was the initial settlement in Tarakan city and still become main city center. Also, vital infrastructure located in the area, such as Juata Airport, business district, and fisheries settlement. As for the North Tarakan District, it will only face moderate to low risk of SLR due to the fact that current development still gave plenty of open space between the settlement and shoreline. This gave baseline for future development to limit them and create more protection for the area.

III. SCIENCE AND POLICY INTERACTION IN CLIMATE RISK AND ADAPTATION ASSESSMENT

Both Semarang and Tarakan City already completed their climate risk assessment and formulated adaptation action. However, there are several differences in terms of process, specifically on how science and policy making interact, as well as its integration towards the development plans. The discussion points in this part will relate to the process of the climate risk assessment, institutional aspect and stakeholder involvement, as well as the process of interaction between science and policy for mainstreaming adaptations into spatial and non-spatial development plans.

3.1 Semarang City Experience

The activity of climate risk assessment in Semarang was being boost up through their involvement on the ASEAN Climate Change Cities Resilience Network (ACCCRN), a network that endorse several cities in Southeast Asia region to assess their risk towards impact of climate change and formulate adaptation actions. The network and proposed adaptation actions itself was being supported by some International Organizations and each participant cities received assistance in practicing the risk assessment. The activity contains several objectives; i.e. includes assessment of current and future climate variability in Semarang city, assessment of vulnerability, adaptive capacity, and current also future climate risk at sub-district level, identification of direct and indirect impact of climate hazards at present and in the future at sub-district level, identification of the most vulnerable areas and social groups, identification of institutional and governance issues that may affect the resilience of the city to current and future climate risk, and development of initial recommendations for Semarang City in increasing resilience of the city to current and future climate risk. At the moment, this activities has already produced current and future risk of Semarang City, thus it is entering the phase for adaptation action installment.

The key process in Semarang City is a mechanism called Shared Learning Dialogue (SLD). Through SLDs, periodically, actors from both science and policy sides met and make agreement upon climate change adaptation actions. Within the span of one year during the risk assessment, there were five SLDs being held. The first SLD mainly aimed to raise awareness about climate change

context and impact in Semarang City. In between the first and second SLD, expert team of ACCCRN in about five months conduced vulnerability and risk assessment. Thus, the second SLD basically served as a dialogue means between policy maker, development stakeholder, and the experts regarding vulnerability assessment result. In addition, this second SLD also questioned the possible roles that each stakeholder may take for climate change adaptation in Semarang.

In between second and third SLD, the city government inaugurates Climate Task Force (as a City Team), comprises of representative officer from different government agencies, local universities, and local NGOs related in managing climate change impact. The head of Climate Task Force was placed at the City Development Planning Agency (Bappeda). Although it's still unclear about the initial motivation of this inauguration, the existence helped to bridge dialogue between ACCCRN Team, government side, and other local actors. For example, it was through discussions in Climate Task Force level thus local NGOs were given opportunity to propose pilot projects as a part of city's adaptation strategy.

The third SLD thus consisted of presentation of four pilot projects of climate change adaptation and draft of City Resilience Strategy (CRS). Later after one month, in the fourth SLD, the dialogues covered the topic of detailed working plan on the CRS, introduction of rainwater harvesting concept as a main donors-sponsored adaptation in addition to the four pilot projects, and debate on mainstreaming of CRS to the city development system. Afterwards, in the span of six months of finalization, thus fifth SLD took place to inaugurate the CRS and joint-statement to ensure continuation of the four pilot projects and rainwater harvesting. The four pilot projects are as follows: 1) Land consolidation models in Sukerojo sub-district, 2) Micro finance program: community based revolving fund for improving sanitation in Kemijen sub-district, 3) Coastal community adaptation in Tugurejo sub-district, and 4) Community adaptation to landslide and cyclone in Tandang sub-district.

It should be noted that the process of climate risk assessment was also being supported by several universities that produce research on related matters. In the process of ACCCRN activities in Semarang City, the Diponegoro University, Soegiapranata University, and National University of Semarang also plays significant contribution at all part of the activities. All mentioned universities were gain access to the SLD and Climate Task Force meetings, thus communicate their related research on climate change even though it was not sponsored by ACCCRN donors.

On the other side of science and policy interaction, at the time when the ACCCRN process being initiated, Semarang City was in the middle of the process in enacting their Medium Term Development Plan (RPJM 2010 – 2015) and General Spatial Plan (RTRW). As for the Long Term Development Plan (RPJP), it was already enacted and legalized. It was a supportive factor that the RPJP already incorporated climate change adaptation as one of the focal point; i.e. stated at the 4th Mission that the development should enhance natural environment utilization and natural conservation, as part of climate change anticipation.

It is indeed that the existence of Climate Task Force played strategic role in communicating the progress of climate risk assessment as enrichment to both plans, and RPJM and RTRW. The CRS as main output of ACCCRN gave several main suggestions that contributed to enrich development strategies mentioned in the RPJM; i.e. can be seen that three out of seven major programs outlined in RPJM was related with climate change adaptation, comprises the management for flood and coastal flooding, public services provision, and infrastructure development. However, it was unclear regarding CRS contribution to the substance of RTRW as main spatial plan of the city. While, the community-based adaptation proposed in CRS, up to date, still in strategic position to influence respective district level Detailed Spatial Plan (RDTR). Yet, hard evidences on the result of this science and policy interaction are still unobserved.

3.2 Tarakan City Experience

The risk assessment and adaptation formulation activities for Tarakan City basically initiated through endorsement from National Government whom has previously discussed with donors and expert to select several levels of case studies for climate adaptation in Indonesia; i.e. as a continuation from the enactment of national level ICCSR document. Tarakan City has been chosen as case study for Climate Risk and Adaptation Assessment (CRAA) at micro level, as part to develop further nationally approved vulnerability assessment methodology, risk, development process of adaptation strategies, and its implementation process to development system (Latief et al, 2011).

Current progress shows that CRAA activities in Tarakan have had finish and met several targets; i.e. climate hazard, vulnerability, and risk assessment in Tarakan City for year 2010 and its projection to year 2030. Within the same time span of one year, process in Tarakan City consisted of six meetings, includes in the form of public consultation and workshop. Following a Kick-off meeting of CRAA for Tarakan city, three months later the 1st public consultation was held to discuss the result of climate-related analysis. Later after four months, second public consultation held to discuss vulnerability and risk analysis resulted from experts to the government agencies. The third public consultation discussed CRAA result integration to development system and the fourth one served to finalize them. After fourth public consultation the team of expert provided a Workshop addressed to build capacity of government officers to learn science and techniques used by the expert in doing climate risk assessment.

Unlike during the process in Semarang City, there was no city task force that comprises of related government and

non-government actors which concern to climate adaptation. The actors involved were mainly Tarakan City Environmental Agency (BLH) and Tarakan City Planning and Development Agency (Bappeda) which played significant roles; BLH involved since the umbrella of the activities itself came from Ministry of Environment, while Bappeda acting as agency which in charge of multi – sectors planning activities. However, the real coordination among the two as well as with other related agencies were still a trial and error practice without certain formidable form. Therefore, several limitations occurred both for the climate risk assessment, adaptation proposal, and limit opportunities to integrate the adaptation to development plan.

In addition, the involvement of other development stakeholder in Tarakan City were also lacking throughout the climate risk assessment, e.g. local universities and NGOs. During the process, only one time one of the local universities attended the meeting. At some point, it was due to the lengthy process of the science-basis assessment that still needs to be improved before meeting greater stakeholder. But on the other hand, it was also because expert and donors did not target them to be incorporated in the process. This circumstance was different with Semarang City, where their involvement were supportive in producing sharp risk assessment and adaptation formulation which became more operable.

At the time of CRAA engagement in Tarakan City, local government had already finished the enactment and legalization of the long-term plan (RPJP) and medium-term plan (RPJM). On this occasion, CRAA did not target both documents as entry point for integration, but it was incline to introduce several probable short term adaptation actions into the annual development plan (RKP). The 2012 RKP thus became the entry point for adaptation action. As for the spatial development plan regime, CRAA activities occurred at the last stage of RTRW planning activities. In this sense, several CRAA findings already mainstreamed into the RTRW substance; i.e. using the opportunities given by the interval between RTRW enactment and its legalization process into local regulation. The Tarakan City RTRW also still needs to be enriched by the Strategic Environmental Assessment Document (KLHS), thus the result of CRAA also influence the substance of the KLHS. During the interval, Tarakan City Government also conducts planning activities for Detailed Spatial Plan (RDTR) for two districts, namely West Tarakan and Central Tarakan, which occurred at the midterm of CRAA activities. Therefore, the strategy taken by stakeholder in science and policy side was to developed several compatible level of adaptation action proposal that included directly to both RDTRs. To this end, it can be seen that while the process in Tarakan directly influence government planning document, it did not initiate any adaptation actions which incorporate local NGOs or community.

IV. SYNTHESIS: SCIENCE AND POLICY INTERACTION TO SUPPORT ENTRY POINT FOR CLIMATE CHANGE ADAPTATION

In Indonesian context, there are several entry points that may be suggested to shift the technocratic side of climate risk and adaptation assessment into a more policy-oriented result; i.e. time adjustment, personal and organizational network, stakeholder involvement, bureaucrat-expert leadership, as well as the importance of science and sector bases. Time adjustment emphasize on decision to see the position of development planning activities within the city. Even though that it would best to introduce CRAA at the earliest path of planning activity, but as long as the legal product have not been legalized then the expert/researcher still have plenty of opportunity to mainstream CRAA result.

As a developing country which practicing democratic regime, personal and organizational network are also important for conducting climate risk assessment as well as adaptation proposal in Indonesia. Up to date, there were still limited but promising experts or research based institutions that are capable in doing risk assessment. However, the challenge is to link the output of particular research into development policy being planned and executed by the government. Strengthening personal network, for instance researcher and bureaucrat, or between organizations would benefit to speed up risk assessment, shaping the context of related activities, and translate the research product into development policy.

The speed of CRAA integration into development plan as well as its implementation after the CRAA process demands a strong awareness and political will by the local government leader. However, in this context, experts may push forward on this occasion, thus it would also helps to speed up the CRAA integration. This may works since in Indonesia, throughout the time, society was more aware towards the importance of knowledge based policy. In this sense, leadership was the key to support the necessity of CRAA integration into the policy; i.e. a) leadership for bureaucrat, which means knowing the needs of the city/region in relation with climate risk; and b) leadership for experts and academia, which means that they are willing to strive more from the research output towards the policy.

Another lessons learned that can be drawn was that Indonesian cities demands better research on basic science of climate change, mostly regarding the downscaling of climate model, as well as how sectors related would consider climate factor or affected by the impact of climate change. Therefore, further strategies that can be proposed include data generation & management, nurturing expert and researches, as well as introduction of science and sectors work to the development policy.

Finally, it should be noted that current combination spatial and non spatial development system in Indonesia is already more integrated one to another, in which also being supported by climate-related regulation; as it mentioned by laws on environmental protection and disaster management.

To this end, based on learned came from both cities basically suggests that climate risk and adaptation assessment can be adjusted in a way that its output may fits to each spatial and non spatial development planning documents, as least in the context of Indonesia, as it can be seen in the figure below. Therefore, Authors suggest the following steps for ensuring climate change adaptation mainstreaming, as its also published in Salim et al (2012): 1) Initiation of workshop to identify sectors covered, stakeholders that will be incorporated (both government and non-government side), collect initial data, and field observation; 2) Public consultation to represent progress on assessment, stakeholder's feedback compilation, and explanation of mainstreaming process; 3) Policy documents study (both spatial and non-spatial), scrutinize its status, substance, and timing, in order to look for connection with climate change adaptation; 4) Focus Group Discussion to present results of assessment, adaptation options, and discuss prioritization with stakeholders using tools such as Hedonic Qualitative Cost-Benefit Analysis, Importance Level Matrix, and Multi-Risk Assessment; and lastly 5) Compatibility study between prioritized adaptations actions with government programs, in which the result can be grouped into mainstreaming to policy document or direct synchronization to governmental agenda and development plans.

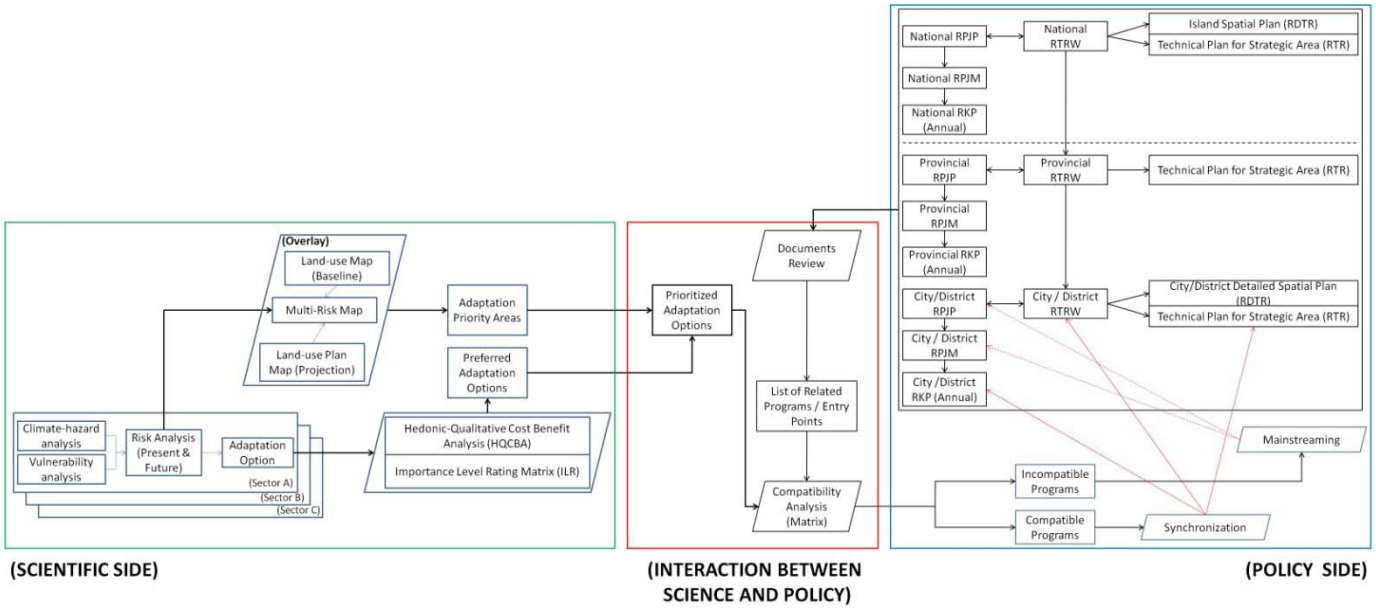

Figure 2 Science-Policy Interactions and Entry Point for Adjusting CRAA to Spatial and Non Spatial Development System (The Context of Indonesian Cities)

V. CONCLUSIONS AND TRANSFERABILITY

In conclusions, identification of entry points should starts with understanding by scientist to the different development planning system may take place in particular country or localities. Scientist must aware of to which policy or planning documents does the recommendation of adaptation actions will be integrated into, since different planning document requires different level of mainstreaming. At the same time, policy maker must clearly convey the necessity of at which level does the climate change adaptation is needed in their respective area; i.e. whether at city level or only particular area of a city.

Afterwards, least-developed and developing countries context, sub-national based network of research institutions, universities, NGOs, private entities, and government must be nurtured in terms climate-sense making. In this sense, should process of climate risk and adaptation assessment take place; it will guarantee a mix of perspectives and stakeholder engagement. Thus, even without the existence of donors, adaptations beyond government's program might be developed.

To ensure accountability, as a result of good science and policy interaction, formulation of adaptation strategies must be based on a risk assessment. This does not means that a single technocratic approach is needed, but a collaborative participation from public and other development actors are equally important. At the same time, this notes the importance of risk communication from scientist to government, scientist to general public, and government to general public.

Finally, the output of science and policy interaction for formulating climate change adaptation in particular city can be categorized into two. The first one is mainstreaming, in which appropriate adaptation actions cannot be done directly in the field, for instance because of time-sense, thus act to reframe development plans. The second one is synchronization in which an urgent or reactive adaptation in-short run or adaptations which instantly connect with particular government program, can be introduce and implemented in a short-amount of time.

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