

POLICY OF SUSTAINABILITY FOR INDONESIAN ROAD DEVELOPMENT

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Abstract

Road infrastructure performance in Indonesia is important, because almost 90% of businesses use the road infrastructure as a way of moving their products. Road Infrastructure itself is a backbone of passenger and good transport as further as economic development. Current challenge is developing policy of sustainable road development. Indonesia is commit to improve the effort in carbon emission reduction as high as 26% through business as usual with self-capability as stated by President Yudhoyono. Then it is followed by the issue of National Action Plan of Mitigation and Adaptation of Climate Change (RAN-MAPI) in road sector which is consist of two phase: (i) Long term RAN-MAPI (2012-2020), and (ii) Medium term RAN-MAPI 2012-2014. The development of vetiver grass and adoption of Asphalt Recycling Technology is the example of environmentally friendly effort related to the National Action Plan. In the end, the objective of Environment Management is to create environmentally sustainable development as planned effort in harmony with environment including resource for development process in order to achieve prosperity and better quality of life of the present and future development.

Keywords: sustainable road, carbon emission, climate change, road development

Abstrak

Kondisi Infrastruktur jalan sangat penting karena 90% usaha menggunakan jalan untuk angkutan produk-produk mereka. Jalan juga tulang punggung angkutan penumpang dan barang. Tantangan saat ini adalah pengembangan kebijakan jalan berkelanjutan. Indonesia sepakat untuk mereduksi emisi karbon hingga 26% melalui kegiatan rutin dengan kapabilitas yang dimiliki sesuai pernyataan Presiden Susilo Bambang Yudhoyono. Berikutnya, mengikuti kebijakan dari Rencana Aksi Nasional Mitigasi dan Adaptasi Perubahan Iklim (RAN-MAPI) untuk sektor jalan yang terdiri dari dua tahap: (i) Rencana Jangka Panjang RAN-MAPI (2012-2020) dan (ii) Rencana Jangka Menengah RAN-MAPI (2012-2014). Pengembangan rumput vetiver dan teknologi adopsi daur ulang aspal adalah contoh upaya ramah lingkungan berkaitan dengan Rencana Aksi Nasional. Di akhir makalah, tujuan dari manajemen lingkungan adalah untuk menciptakan pengembangan lingkungan berkelanjutan sesuai dengan upaya untuk menciptakan kelarasan lingkungan termasuk sumber daya dalam proses pengembangan untuk terciptanya kemakmuran dan kondisi kualitas lingkungan saat ini dan masa depan.

Kata-kata kunci: jalan berkelanjutan, emisi karbon, perubahan iklim, pengembangan jalan

INTRODUCTION

The country Indonesia, the biggest archipelago country in the world, consists of 17,550 islands located in South East Asia Region near by other countries, such as Malaysia, Singapore, Philippines, Timor Leste, Australia, and Papua New Guinea. The country has a huge population, approximately 220 million people, and has a lot of good natural resources. With these potential resources, this country has a lot of opportunity to grow and accelerate the regional economic development.

Road sector in Indonesia plays an important role in order to create a good national transportation service which is efficient, economic, capable, good quality, and safe. Based on the data from the Indonesian Statistical Bureau (BPS, 2004), it is shown that road infrastructure network serves almost 90% and 92% for goods and passengers, respectively. It is recognized that the existence of road network infrastructure fulfills the needs for mobility for goods and people. Therefore, it should be maintained properly in order to reach potential points, production, and distribution to processing areas as well as distributing it evenly to all areas across the islands and overseas.

Currently, the total capital value of the national road infrastructure is more than two hundred trillion rupiah, which is very strategic to reduce the transportation costs. Thus, it must be given attention to be powered as a requirement to increase the economic competitiveness between national, regional, and local. According to literature, the multiplier effect of the road development for the economic development indicates between 2.5%-3.5% for national level, 2.0%-2.5% for regional level, and 1.5%-2.0% for local level. The outcome of the economic development are to increase work opportunity, business output, added value for properties, income per capita, and land value.

SUSTAINABLE DEVELOPMENT

Every infrastructure project always has two sides of impacts, either good for economic and environmentally impact. In one side infrastructure development is giving prosperity for people; however in the other side it also reduces the quality of life of human being. This is one of the backgrounds of the concept of Sustainable Development.

Sustainable development is a development which *"meets the needs of the present without compromising the ability of future generations to meet their own needs"*. Since 1982 the sustainable development concept has become one of consideration factors in developing the infrastructure which is stated by *"Undang-Undang No.4/1982 about Ketentuan-ketentuan Pokok Pengelolaan Lingkungan Hidup (Environmental Management)"*, which is then completed by *"Undang-Undang Nomor 23/1997 about Pengelolaan Lingkungan Hidup (Environmental Management)"*.

The objective of Environment Management is to create environmentally sustainable development as planned effort in harmony with environment including resource for development process in order to achieve prosperity and better quality of life of the present and future development. Nowadays, Environmental Impact Analysis (AMDAL) is one of the mandatory requirements of the infrastructure project. The analysis is conducted not only in the planning phase but also in feasibility study, planning, as well as construction and operational phase.

GLOBAL WARMING ISSUE

Nowadays, people awareness regarding global warming is starting to increase. The global warming impact is starting to persuade world leader to brought environmental conservation as one important factor in decision making consideration. In 1992, 191 countries in the United Nations Framework Convention on Climate Change (UNFCCC) forum looking for solution for reducing global warming agree to declare the Kyoto Protocol. **The Kyoto Protocol to the UNFCCC** is an international treaty that sets binding obligations on industrialized countries to reduce emissions of greenhouse gases. The UNFCCC is an environmental treaty with the goal of preventing dangerous anthropogenic (i.e., human-induced) interference of the climate system. According to the UNFCCC website, the Protocol "recognizes that developed countries are principally responsible for the current high levels of Green House Gas emissions in the atmosphere as a result of more than 150 years of industrial activity, and places a heavier burden on developed nations under the principle of 'common but differentiated responsibilities'." There are 192 parties to the convention: 191 states (including all the UN members except Andorra, Canada, South Sudan and the United States) and the European Union.

Indonesia, as global community, takes part in tackling the climate change challenge. In the view of infrastructure development, environmentally sustainable infrastructure development was applied on the process of building the road infrastructure through AMDAL in each phase of infrastructure development and utilization of environmentally friendly technology.

NATIONAL ACTION PLAN-MITIGATION AND ADAPTION CLIMATE CHANGE IN ROAD SECTOR

In World Leader Summit (KTT) of Earth in Rio de Janeiro 1992, Indonesia becomes one of the countries which adopting UN Convention of Climate Change (United Nations Framework Convention on Climate Change). Then Indonesia issues Law No. 6/1994, about Legalization of United Nations Framework Convention on Climate Change, which consists of 3 main strategies, as: (1) achieving stability of carbon emission in the safe level; (2) developing common but differentiated responsibilities; and (3) developed countries will assist developing countries in financing, insurance, and technology transfer in tackling the climate change issues.

President Susilo Bambang Yudhoyono, in G-20 Summit in Pittsburgh 2009, commits to improve the effort in carbon emission reduction as high as 26% through business as usual with self-capability and will be 41% with international support. It is then giving significant contribution for national development policy in each sector related to emission reduction.

National Action Plan (RAN-MAPI) in road sector consists of two phase: (i) Long term RAN-MAPI (2012-2020), and (ii) Medium term RAN-MAPI 2012-2014. The Long Term RAN MAPI (2012-2020) of road sector consist of 3 parts, which are: (i) mitigation strategy and adaptation, (ii) targets of 2012-2014, and (iii) target of 2015-2020. The Medium Term RAN MAPI (2012-2014) of road sector is implementation effort in Year 2012-2014 of the Long Term RAN MAPI. It includes: (i) developing output which is adapted to program format in Strategic Plan of Ministry of Public Works (Renstra PU), (ii) the component, (iii) year of implementation and (iv) cost.

In term of the strategy of mitigation, the strategies are as follow:

- a. Developing national the concept of environmentally and climate change friendly Road network; the strategies are developed with following targets: (i) improvement of subservience of road project toward environmentally rule, (ii) develop the concept of adaptation of non-motorized mode transport (cycle and pedestrian) in the whole road network in the integrated transport system, (iii) plant trees in the road corridor and the side of the corridor, and (iv) planning concept and developing the pilot of environ-mentally friendly road networks in harmony with spatial plan, geometric standard and other facility in order to promote energy saving and environmental friendly.
- b. Reducing urban traffic jam in order to reduce vehicle carbon emission; the strategies are developed with following targets: (i) construction of new bridge, fly over, underpass, and tunnel to reduce urban traffic jam, and (ii) methodology study, and evaluation (Measurement, Reporting, Verification) road sector emission reduction
- c. Develop and promote using of “environmentally and climate change friendly” construction and material technology in road sector; the strategies are developed with following targets: (i) developing technology and specification of pavement and road structure using recycling technology and waste technology, (ii) identify new alternative environmentally friendly vehicle fuel, and (iii) availability of Hot Mixed and Warm Mixed Asphalt specification.

In term of the strategy of ADAPTATION, the strategy is reducing the risk of intervened road function as the impact of flood, rise of sea level, and other natural climatically disaster. The strategies are developed with following targets: (i) construction/maintenance of erosion retainer for road, (ii) good drainage and storm-water system for urban road, (iii) collection of disaster-prone road network as a database, (iv) developing the concept of road administrator incentive in tackling of climate change, and (v) developing the concept of climate change adaptive road link through landscaping, absorber well, and pored pavement.

AN EXAMPLE OF ADAPTATION STRATEGY

An example of adaptation of strategic adaptation is utilization of *vetiver grass* (see Figure 1 Vetiver Grass). Its function is to retain the pavement and slope reinforcement.

Vetiver grass is a tropical plant which grows naturally. The species which is most common is referred to in scientific term as *Vetiveria zizanioides*. This species appears in a dense clump and grows fast through tillers. The clump diameter is about 30 cm. and the height is 50-150 cm. The leaves are erect and rather stiff with 75 cm of length and 8 mm of width.



Figure 1 Vetiver Grass

If planted along contours across the slope, the clump which stands above the ground will produce tillers, forming a green hedge. This thus makes it capable of trapping crop residues and silts which are eroded by runoff and enabling them to naturally form an earth embankment. Since vetiver grass has a deep thick root system which spreads vertically rather than horizontally, it can efficiently endure harsh conditions. The roots densely bind together like an underground curtain or wall enabling it to store water and moisture. However, since the root system expands sideway up to only 50 cm. it imposes no obstacle to the nearby plants and is thus considered an effective measure for soil and water conservation. Vetiver hedgerows maintain soil moisture and soil surface and at the same time, are suitable for cultivating along with economic crops. Growing vetiver grass is simple, applicable and money-saving. The practice can lead to the strengthening and sustainability of the farming system in rained areas and can be applied in other areas for preservation and conservation of natural resources such as along the banks of the irrigation canals, reservoirs or ponds along the road shoulders and the approach of a bridge, as well as in forests.

Another example of the strategy is the implementation of Asphalt Recycling Technology. Road recycling is a way of maintaining and upgrading existing roadways. Road recycling is a fast, natural reconstruction method to rehabilitate the damaged roads. It is efficient, environmentally friendly and economical method. Normally, it uses a tractor to drive the recycling unit which can achieve an average of 40 sqm per minute. Then it is being leveled, graded, and profiled to the required specification using a tractor mounted grader. The surface is then rolled and compacted and ready for the finished application.

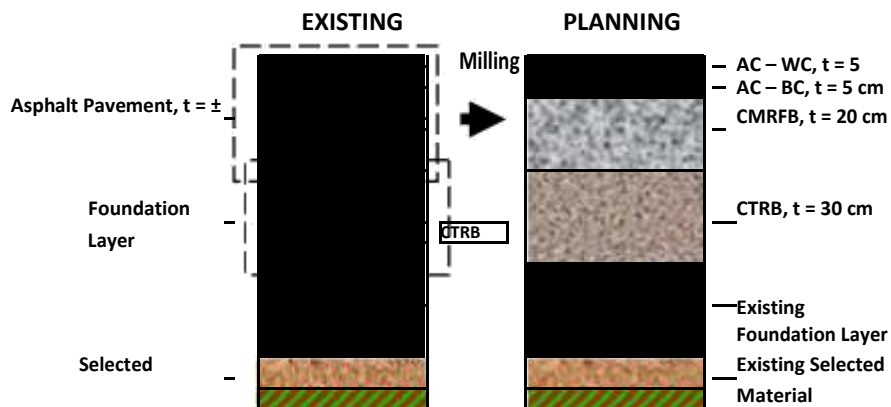


Figure 2 Typical Road Pavement Recycling Technology



Figure 3 Recycling Equipment

Road pavement recycling types used in Indonesia are cold mix recycling such as Cement Treated Recycling Base (CTRB), Cement Treated Recycling Sub Base (CTRSB), cold mix recycling by foam bitumen (CMRFB), and hot mix recycling where reclaimed asphalt pavement is processed in plant. Cold mix recycling use materials from reclaimed asphalt pavement, reclaimed aggregate material, new aggregate (if necessary) and cement. These materials are compacted in optimum water content. It also follows the Unconfined Compressive Strength (UCS) criterion. Type and pavement quality are essential for a successful implementation of road pavement recycling technology such as CBR must be strong enough and the foundation layer is the right thickness. The typical road pavement recycling technology and its illustration can be seen in Figure 2.

The implementation of road pavement recycling technology should consider two important things, namely the existing materials on the old pavement can be used for recycling properly and the mix recycling can meet the standard requirement of recycling criteria. Based on these, a pavement investigation at the first step of implementation on site is needed. The investigation is to check the thickness and the width of pavement, type of materials for each layer, CBR, ground water level, public utilities, and traffic volume as well as axle loads. The example of road recycling equipment is shown in Figure 3.

CONCLUSION

In order to support National Action Plan-Mitigation and Adaptation Climate Change in Road Sector (RAN-MAPI), the development of research related to: (i) Vetiver Road, (ii) environmentally friendly technology such as asphalt recycling, and (iii) pedestrian technology should be developed.

In the end, infrastructure as the supporting system of economic development and the foundation of regional land use should deliver effective, efficient, safe, and comfort services. Then, infrastructure should facilitate production activities in order to improve product competitiveness. Therefore, with the support of good infrastructure, a Productive, Comfort, and Sustainable national space is expected to be delivered.

The objective of Environment Management is to create environmentally sustainable development as planned effort in harmony with environment including resource for development process in order to achieve prosperity and better quality of life of the present and future development.

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