

## Application of Web 2.0 Technologies for Integration of Land-use and Transportation System

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### 1 ABSTRACT

Transportation networks are the life line of any city but only when the decision of land-use system and transportation system are integrated in smart and intelligent ways. The present paper examines the complexities of development and planning decision that are embedded in the process for finding an effective solution for integration of land-use and transportation system. The present paper also answers the question that how society democratically and effectively access to Web 2.0 technologies for spatial information and translate the virtually tested, analyzed design in the real world. In overall, the paper tries to frame a concept to use Web 2.0 technologies as a tool for establishing Intelligent Transportation System within the existing land-use system. No doubt Web 2.0 technologies in the cybernetic age is the fastest way to access, collect, analyze and transfer spatial information and providing innovative, sustainable, participatory solutions for effective government and community empowerment. However, the use of Web 2.0 technologies in transportation system is not the part of smart city model in India. Hence, the paper will act as a guiding principle and methodology for Smart City Mission in India. The paper also suggests the possible ways to establish Web 2.0 technologies applications for intelligent transport system through community base local Neighbourhood Digital Technology Center (NDTC). The establishment of NDTC will give local urban community free hand to tailored or customized Web 2.0 software as per their need and requirement and generate or manipulate their own information or spatial data rather than given answer or raised query to the predefined proposed land-use map.

Keywords: integration, web 2.0 technologies, intelligent transportation system, land use system, real time data

### 2 INTRODUCTION

In India, with the present urban population of 410 million person, it is estimated that 814 million person by 2050 will be living in Indian cities. In order to cater the need of large urban population and growing economy, the transport sector plays an important role. It is also evident, that, as urban area contribute 58% of countries GDP, transport sector alone share is 6.7% (2016) and which is expected to increase 12% in 2026. Ever growing economy of India has witnessed a steep rise in demand for transport sector. About 85% of passenger and traffic and 60% of freight are taken care by road sector. If compared with USA (0.65 Kms) and China (0.16 Kms), density of Indian Highways are 0.66 Kms of roads per square Kilometre of land. Opening up of Indian economy during 1990's and stating of Smart City project in 100 cities, India has witnessed a rise in demand for transport infrastructure and services. However, the growing complex urban economies in India has not been able to keep pace with rising demand of efficient and sustainable transport system. Out of 87 metro's only 20 cities have organized transport system and only 4 metro cities have rapid mass transportation system. Even the share of public transport in these metro's cities are decreasing from 69% in 1994 to 38% in 2007. The transport data of major metro cities reflected that the share of slow moving vehicles are given way to fast moving vehicle and so it also true for public transport to private transport sector. Thus, in combination with demographic change, social changes in lifestyle, impact of social media, had gear-up the pace of mobility on the one hand; and lack of integrated development strategies for efficient transportation system leads to mounting congestion and pollution in India cities on the other; resulting in low economic return, low quality of life and high environmental & social cost.

In the present age of Information and Communication Technologies (ICT) the urban planner and manager looking forward to Web.2.0 and other freely available internet base applications to solve complex urban problems of integrating land-use and transportation system. Transportation networks are the life line of any city but only when the decision of land-use system and transportation system are integrated in smart and intelligent ways. The present paper in the context of Rourkela Smart Transportation System Project (RSTSP) and Comprehensive Development Plan of Rourkela (one of the Indian smart city project in Odisha

State) examines the complexities of development and planning decision that are embedded in the process for finding an effective solution for integration of land-use and transportation system. It is evident that smart and intelligent transport system will boost the economy of any urban area. In this context the present paper answers the question that how society democratically and effectively access to Web 2.0 technologies for spatial information and translate the virtually tested, analyzed design in the real world.

### 3 WEB 2.0 TECHNOLOGIES FOR TRANSPORT MANAGEMENT

Online Web 2.0 technologies are interactive, participatory, transparent, interoperable, share, tag, locate and involve citizen for decision making. In fact Web 2.0 Technologies help in people participation through customization of city planning information and data tailored to their need, requirement and priorities. The citizen can create or identify content, edit and give preference or request to government or urban development Authorities/ managers for inclusive, participatory planning process and decision making.

In order to disseminate information over the digital platforms Web 2.0 technologies provide limitless possibilities for social inclusion of the local community for making urban planning and design sustainable cities. Web 2.0 technologies which is participatory web applications one can participate and create their own content and communicate over map, sketch, picture with the local and worldwide governance system, irrespectively language difference. Infact Web 2.0 is a powerful tool to communicate by the planner with the local community and vice-versa. Social networking sites, Google map Mashups, blogs, YouTube, are some of the effective example of Web 2.0 technologies. Moreover, Web 2.0 technologies are also providing transparency to the governance system through interoperability of the urban planning. Transparent government system is the essential need for social inclusion and local community involvement in the planning process.

Basic importance of the Web 2.0 technologies is that, all unconventional data, irrespective of its source, which have geo-located information, can be used for planning purposes. Thus, the use of this unconventional data to translate in to planning solutions will define the Smart E-Solution Model for Rourkela or any other city. For example data available on road side camera for traffic management will provide many important data if fixed with the Urban planning portal, banking transaction system, smart phone video recording and uploading on social networking sites, controlling social behaviour or traffic movement on roads through FM Radio, GPS installed on taxi and many innovative data mining techniques will measure the smartness for defining Smart Urban planning. (S.K. Raut and P.B. Raut, REAL CORP, 2016)

With reference to Transportation system many Web 2.0 application tools can be used, however, one specific application can be used for one Transportation solution in one region/city and similar Web 2.0 application can be use to find out other solutions of problems in transport sector. The most important use of Web 2.0 technologies is to have real time data and accordingly taking decision on ground. For identification of traffic and transportation problems, Web 2.0 application site like 'SeeClickFix' is an good options for tagging the issues or problem on Google Map and also give option for voting i.e. interactive and similarly exposing the government agencies for not taking the community problem more seriously or making the government more responsible, transparent and efficient. SeeClickFix help government agencies to prioritise the problems issues through voting pattern and similarly channelizing the funds for larger satisfaction of urban community. Hence, Web 2.0 applications are customized and entrepreneur specific and not region/city specific or not for exclusive use for single purpose but multiuse technologies. Another example is Cyclopath, a common Web 2.0 application generally used to find out the best possible way for bicycles. However, by using Cyclopath, crowd sourced unique rating system data will help to find the best routes for buses and trucks and will also interact with best possible way to reach particular destination. One of the important things to know that Cyclopath includes interactive map that can share edit and tag information and can be seen worldwide.

A Mashup is a web application that combines data from more than one source into one integrated tool. These Mashups are created by internet users, for internet users. Google Map's, Map my India and Wiki map are very popular sites that may be quickly incorporated into Mashups. There are over 1500 Google Maps Mashups in existence, allowing users to calculate electoral votes spatially, rate restaurants, map out their running routes, and even plot celebrities' homes on a map or share stories. The potential utility for Google Maps Mashups in Smart and Intelligent transportation System is enormous. User submitted information can

make the job of transport planners much easier. In particular since communities are often competing for new residence based on the quality of life they offer, Mashups are a very useful tool for transport planning and to have quality of life. The government or transport services provider and users looking for better routes to avoid congestion, festival routes etc all can find a Google Map's Mashup to help them do so. For example morning walk communities who are planning to find better place or route in a more advanced Mashup for good health, better environment and sustainable city research, which helps a particular community to plan routes using a variety of criteria such as distance, elevation change, air quality, and amount of vegetation. This type of Mashup, can also calculate calories burned and index of good health for better working performance. This Mashup could contribute to increasing morning walker safety. Planning offices could provide this service using base GIS data and let citizens add useful information, such as green areas needed for better health, the location of yoga centres, or particularly scenic or safe routes. As the internet moves ever more toward user generated content and functionality, planners have a tremendous opportunity to take advantage of community knowledge especially through spatially oriented Mashups. Such Mashups can be used to maintain power and water supply, efficient traffic and transportation system, safer cycling route, safer school cab route, efficient management of other services for the community etc. (S.K.Raut and P.B. Raut, REAL CORP, 2015).

#### **4 BACKGROUND OF ROURKELA CITY**

Literary Rourkela according to the 'Sadri' language means "your home". Raulia a tribal community had been living in the village since time immemorial. The erstwhile revenue village is now known as "old Rourkela". Before the industrialization which took place in 1951 the population of Rourkela was very low, only 4000 persons. The establishment of Rourkela Steel Plan (RSP), a unit of Steel Authority of India Ltd (SAIL) followed to the set up of number of small scale ancillary industries had witnessed a sudden influx of population i.e. 35000 persons in 1961. According to the 2001 census the population had increased to 259553. This registers an annual growth rate of 16.04% which is much higher than the growth of urban population in Odisha. Today Rourkela is an important industrial cum commercial hub of Odisha state. Employment opportunities and benefit of economies of scale made Rourkela an economically vibrant town attracting people from its vast hinterland. Rourkela Planning Area with a geographical area of 259.18 sq km comprises of 52 revenue villages, Rourkela steel plant, Steel Township. Reserve forest constitutes 4.39% of the total planning area. Koel River flowing from east to west divide the entire planning are into three parts. Rourkela Development Authority executes the town planning schemes as well as the development control aspects of the Rourkela Planning Area. Basically the development authority and the municipality – these both two government functionaries are held responsible for the overall development of the Rourkela Planning Area.

#### **5 CONCEPT OF INTELLIGENT TRANSPORTATION SYSTEM THROUGH WEB. 2.0 APPLICATIONS FOR ROURKELA SMART CITY**

In India ITS application are limited in use and less developed. Delhi, Pune, Bangaluru, Chennai are few ITS application example with area wide signal control, parking information system, advance public transportation, toll collection etc. Integrated Multi-Modal Transit System for Delhi was lunched during 2011 which is similar to London and Paris Bus Services. The 119 public buses are fitted with GPS in order to have real time information for location and speed. These buses are also fitted with electronic ticketing machines which generate real time ticketing information to identify the ridership. The buses are also fitted with in-built speed governors which regulate the speed of the buses. The voice announcement system, inform commuters about the upcoming bus stops and buses also have CCTV cameras on board to improve security. The cluster buses will follow a unified time table developed by Delhi Integrated Multi Modal Transportation System (DIMTS). 'Trako' application is also developed by DIMTS for tracking Delhi Corporation Buses with users Mobile phone. Passenger Information System is developed to give information on user mobile through simple SMS. Kerala Police launches e-challans system to enable motorists to pay fine for traffic violations through bank. The Kerala Traffic police issues a bank e-challan with 10-digit alphanumeric code to the traffic violator. The defaulter will pay the e-challan on the spot or at any SBT Branch (Bank Branch) or Akshaya Centre (e-Centre of Kerala Traffic Police) within 20 days. Unable to pay in the stipulated period, court will come into picture.

ITS model simulate the local locational behaviour of residential and workplace mobility pattern. Integrated Land-use Transport Model provides out-put in digital data format for a predefined set of indicators. With the real time data and crowd sourcing application for flow of traffic on the Rourkela city roads/ streets the transportation system can be managed through rerouting buses or opening/identify new lanes for real time traffic flow. Through the intigration of parking spaces and user community over Web 2.0 application or SMS mobile network cam solve the parking problem of heavy vehicals

Rourkela is the hub of Industrial and commercial activities. In the core of Rourkela, Iron and Steel Industries unit is located where the raw material are brought in bulk, stored and finished product are flow out. Apart from core area of Rourkela, other areas like Kulunga and Kumarmunda have ancillary Industries of sponge iron and expansion of these industries have contributed more quantities of raw material and other commoditie, thereby increasing the pressure over the existing infrastructure. This has resulted in acute traffic and tranportation problems like increasing traffic jam, accidents, environmental pollution. The smart city project of Rourkela is an attempt to establish intelligent transportation system for not only goods traffic but also for passenger traffic movements and management.

In combination with existing website of Rourkela Development Authorities (RDA) freely available Web 2.0 application can be connected or developed, for dissemination of government information to its citizen or taking public opinion. The existing Smart City website ‘Smartnet’ of central government can be developed for Rourkela Intelligent Transportation System (RITS) to disseminate customized transport information and data to its citizens for:

- (a) View, create and edit.
- (b) Obtaining public feedback
- (c) Providing voting rights
- (d) Inviting transportation solutions from public
- (e) Responding to public question/complaints.

With the concept of RSTS, RDA will experience the saving of time and cost for execution of transport related work and repair, and have more satisfaction of citizen and stakeholder. Moreover, the uses of Web 2.0 applications will improve the internal government agencies communication for more effective decision taking and improving public understanding. In order to tackle the problem of receiving lots of unsupported data from public which make it difficult to filter more meaningful and useful data for effective transportation system, Web 2.0 application Guidelines and Web base law abiding rules and regulation can be framed and put in place.

It is learned from the world wide Web 2.0 technological projects that wide varieties of Web 2.0 application are required to use for different purposed and accomplish project aim and objectives. And also the city like Rourkela where only 39 percent of urban population have access to internet facilities, it becomes difficult to even think to use Web.2.0 technologies base solution to establish Intelligent Transportation System (ITS). However, it is possible after identifying the interested citizen keen to support the project for making core citizen group (CCG) may be called ‘YATAYAT FIELDER’ (YF). The Yatayat Fielder will be chosen from the different areas of the city and of different communities those have smart phones and have basic education and off course to have interest to take active part with the government. These CCG will work with RDA government official in more effective way to analyse content and solve traffic related problems.

Under the National Urban Information System (NUIS) Scheme, the author already suggested to establish community based local Neighborhood Digital Technology Center (NDTC) at neighborhood level and City Digital Technology Center at City level of all smart cities selected (S.K.Raut and P.B. Raut, REAL CORP, 2015). This NDTC will have internet base GIS lab which will:-

- (a) Provide access to GIS and Web 2.0 technology;
- (b) Provide information for other related information generation agencies;
- (c) Store public information and database;
- (d) Analyze public information and feed to the main City Digital Technology Center (CDTC); and
- (e) Influence decision making and participatory planning processes.

The Yatayat Fielder will feed/communicate the transport related data to NDTC. Hence, NDTC should be managed 'by the people'; provide information to planning authorities 'for the people'; and information generated 'from the people'. NDTC should be accessed by any local community and, thereby, giving the people empowerment and direct access to digital spatial data system. These Yatayat Fielders should be identified for providing training and access in GIS and Web 2.0 technologies especially to poor and slum areas for inclusive public participation. Thus, this is the answer to digital divide and reducing the gap between planning professionals and local public.

Town and Country Planning Organization under the Ministry of Urban Development is ready to give support to RDA and other selected smart cities for identifying smart citizen/government official for GIS and Web 2.0 technological oriented services for use of digital information and its generation, so that its benefit reach to the lower section of the urban community. This would call for sustainability of good quality of Web 2.0 services to citizens for e-governance of the Town Planning organizations and departments which should be fully computerized for delivery of public services and internal functioning of the office. GIS and Web 2.0 technologies education and training and its application for public awareness is another important issue which will act as a foundation for the growth/ success of Web 2.0 technologies. The School of Planning and Architecture (SPA) should take a lead role to facilitate IT and Web 2.0 technologies education to foster budding planner for smart understanding of Web 2.0 technologies. The existing planning professional should be given short training to become technology savvy. The most important areas are software development, Entrepreneur GIS and customized Web 2.0 technologies for Transport Planning application and tools should be developed. These software need to be simple, user friendly and affordable. For Web 2.0 technologies Promotional Group professional organization (like TCPO) and educational institutional (like SPA) should be integrated to maximize the output and professional satisfactions. An awareness programmes to make Web 2.0 technology based planning and public participation software, as a mass movement need to be worked out by encouraging value added network services in the form of 'Telematic Kiosks/ window for 'One window and Non Stop' series for the urban community. These programmes and training should be in local or regional languages in order to have easy understanding and social acceptability.

## **6 RITS PROJECT ARE DIVIDED UNDER FOUR STAGES:**

(a) Establishment of e-Platform: Crowd sourcing Web 2.0 application platform will be established at NDTC and CDTC in local language for wider acceptance. Integration of various Web 2.0 applications over single platform are required to be created in order to support multi functional Transport sector need like, parcel services; at home care services for the elderly and emergency services; care sharing; driver assistance system; use of standardised message set by the stations/platform; exchange information between each other (user and provider); receiving and analysing data for decision making; improve safty and clean environment; traffic efficiency by harmonising traffic flow and planned driving; increase driver comforts and; efficient, safe inter modal transfer. Thus in order to support more and more function multi level Web 2.0 applications platform will be served by single Web 2.0 application platform.

(b) Collection of Data through Crowded Sourcing: The process of collection of data first compounded through unconventional sources through identification of the Intelligent Crowdsourcing and creating a crowdsourcing information platforms. Mobile and internet alert application software should be put in place for reporting and collection of data. Social networking application like Facebook will be best suited and widely accessed by the public. Moreover, collection of data application will also be used by Yatayat Filder in a easy and friendly manner.

(c) Analysis of Data: Collective resources information generated by the Crowd sourcing information platforms should be connected with the different analysing computer models and translating the results for crowd computing. Local community should be mobilized to analyse the solutions of the problems and concluding the solutions over technical controlled but transparent platform. The Web 2.0 application platform should be such that users can provide, analyse and share data to give solution for specific transportation issues and problems as well as also able to see and analyse other views and data tagged. Mashups, Google Groups, Next Stop Design, Virtual Meetings etc and Web 2.0 applications will support transportation data analysis.

(d) Solution and Decision Making: Crowd sourcing should be encouraged to create designing solutions over online mapping and defining the content of the plan for creation of virtual plan. For implementing virtual

plan over real space will give pride and social satisfaction to the local community and even come forward with innovative idea for fund raising. Web 2.0 applications like Simulation Games will create simulated real world model for finding solution and appropriate design on virtual world. Mobility, Next Stop Design are some of the example for decision making Web 2.0 applications for ITS.

## 7 CONCLUSIONS

In overall, the paper tries to frame a concept to use Web 2.0 technologies as a tool for establishing intelligent transportation system within the existing land-use system. No doubt Web 2.0 technologies in the cybernetic age is the fastest way to access, collect, analyze and transfer spatial information and providing innovative, sustainable, participatory solutions for effective governance and community empowerment. However, the use of Web 2.0 technologies in transportation system is not the part of smart city model in India. Hence, the paper will act as a guiding principle and methodology for Smart City Mission in India. The paper also suggests the possible ways to establish Web 2.0 technologies applications for intelligent transport system through community base local Neighborhood Digital Technology Center (NDTC). The establishment of NDTC will give local urban community free hand to tailored or customized Web 2.0 software as per their need and requirement and generate or manipulate their own information or spatial data rather than given answer or raised query to the predefined proposed land-use map.

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