Changing the Goal Post:
A concept note to address Mumbai Metropolitan Region's congestion problems -
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Mumbai Metropolitan Region's congestion and its attendant problems are evident and almost all of us have had first hand experience of traffic snarls. Increased number of flyovers and freeways, the introduction of monorail are examples of the State Administration's proactive responses.

However, the problems just seems to expand to defeat the solutions. Long gestation periods and very high budgetary outlays are two examples of shortcomings in the current responses.

Therefore, what is needed is disruptive innovation in solving the problem. Mumbai with its extensive telecommunication network and Internet penetration lends itself well to the concept of telecommunting. A concept which if implemented well, is a potentially disruptive innovation capable bringing about a paradigm shift in urban planning.

Undoubtedly, there will be many, who by virtue of the nature of their work, cannot telecommute. Borrowing from the philosophy of smart growth of cities, such work can be clustered in a distributed manner across Mumbai so as to ensure that even citizens in these professions do not have to travel more than five kilometres to work.

The success of the proposed solution hinges on a number of factors. A detailed study of the problem, its proposed solution, implementation methodology and time-lines. These will necessarily have to be mandated by supporting legislation. Resistance will emerge from vested interests and doubting Thomases. I am convinced that these can be overcome with education and commitment. There have been numerous pilot project implementations of telecommuting worldwide and everyone of them has yielded encouraging and positive results. The following concept note is an attempt to bring out the value of this revolutionary approach to the overcome the all pervading problems caused by congestion.

The Problem and Current Responses

There is no doubt that Mumbai has a looming problem. A problem which if not adequately addressed, will worsen the quality of our life and probably balloon into intractable proportions. Shri Prithviraj Chavan, Chief Minister of Maharashtra obliquely referred to this in his address to the 57th. National Development Council Meeting in 2012. This theme recurred in his speech at the inauguration of Centre for Urban Science and Engineering. To quote from his observations: ""Rapid urbanisation has led to a plethora of challenges and problems. One of the issues faced by future urban cities would be how to design policies for urban planning taking into account science, technology, social, psychological, environmental, financial and other aspects into consideration."

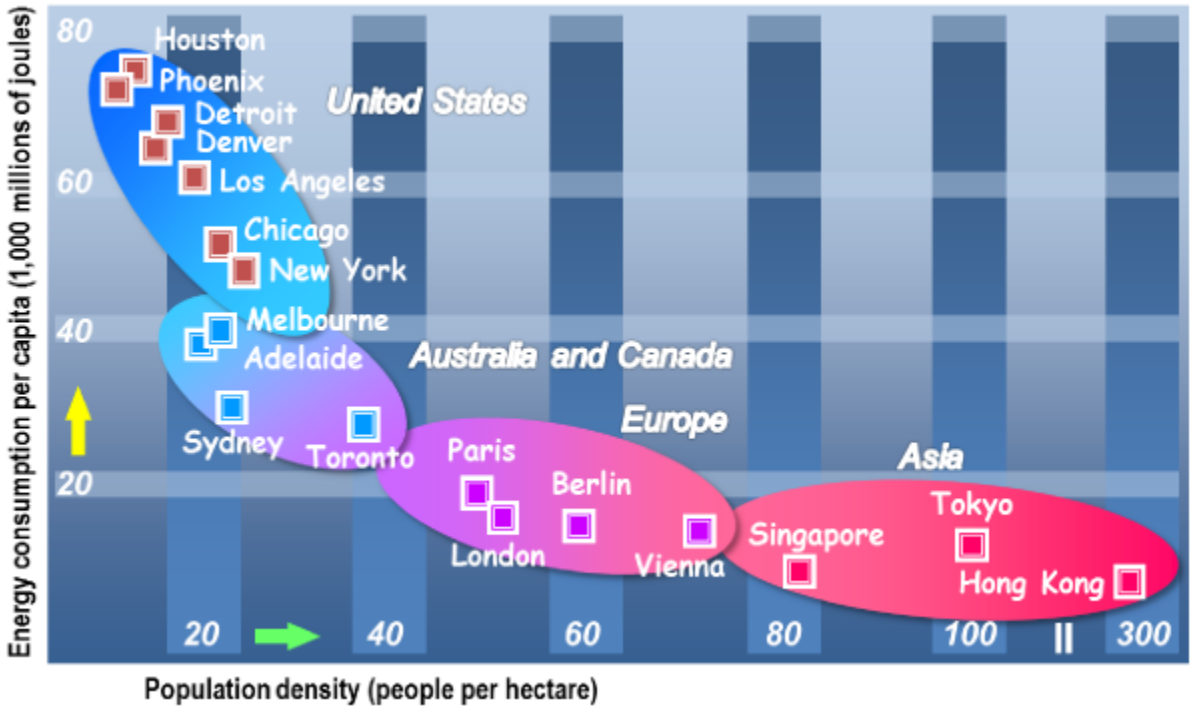
The MMR region spread over 4355 sq. km. has average density of 4822 persons per sq. km. With a population of 21 million (census 2011), it is ranked as the fifth largest metropolitan region in the World. Mumbai's multitudes and their need to travel are at the root of Mumbai's congestion. A problem compounded by the fact of huge distances between residences and places of work. The estimated travel demand is around 78 billion passenger

km every year.. Average trip length in Mumbai is 11.45 kms, the highest in India, a major cause of undue load on the transportation networks.

Congestion, is an inevitable consequence when the private sector produces an unlimited number of vehicles and expects the public sector to spend limited resources to build an unlimited amount of space for them to run on. Trying to alleviate traffic congestion with more road capacity is like trying to reduce obesity by loosening one's belt. In a research paper published in the American Economic Review, a pair of economists from the University of Toronto confirm the fundamental law of highway congestion, but argue it doesn't go far enough. By analysing traffic data and road capacity in U.S. cities from 1983 to 2003, they also provide evidence for a fundamental law of road congestion — one that extends beyond interstate highways to include a "broad class of major urban roads." In other words, no matter how many lanes of road you build, you can't stop cars from jamming them up. Urban congestion can't be addressed by increasing road capacity. That's always been a tough fact for people to accept; as Lewis Mumford wrote back in the New Yorker back 1955: "People, it seems, find it hard to believe that the cure for congestion is not more facilities for congestion."

CRZ rules restrict our ability to expand and the cost of constructing roads is huge. Just the Mumbai Trans Harbour link is expected to cost upwards of Rs.10,000/- crores. The Bandra Versova sea link is estimated costs in the region of Rs.7,000/- crores. Add to that the environmental cost of such projects. Undoubtedly, impacting Mumbai negatively. The evidence till date, establishes the limited relief accrued from traditional responses to problems of congestion. In fact, such traditional solutions have long gestation periods and a poor Return on Investment.

"There is an intricate relationship between urban density and energy (fuel) consumption. North American cities are among the most energy intensive while Asian cities are much less energy intensive. "



Source: adapted from Newman, P. and J. Kenworthy (1999) Sustainability and Cities: Overcoming Automobile Dependence, New York: Island Press.

One of the major goals of sustainable transport is to reduce the travel demand, particularly by motorized modes, through the reduction of number of trips and trip lengths. The way developments are organized in a city impacts the trip lengths and number of trips that the city dwellers need to make to get access to people, goods, opportunities and services. Further, these factors result in wide range of issues viz. air pollution, noise, congestion, accidents. Thus impacting the quality of life. Dense developments and mixed use developments is key to designing liveable communities. Liveable communities improve the quality of life because people walk and bike more making them healthy. It decreases total vehicle traveled miles, decreasing traffic congestion and air pollution. It decreases the amount of time people spend for traveling to go to work or other purposes. People can spend the saved time with their family or for recreational purposes. People are able to socialise with their neighbours more and help one another. This makes the city more vibrant and increases the social unity among residents.

Traditionally, urban planners and Government have responded to the problem with a combination of:

- Congestion tax
- Road widening
- Building flyovers
- Mass rapid transport
- Disincentives for additional vehicles

Traffic impact mitigation methods for new developments

Land-use measures		*Transportation measures*	
Land-use planning	*Land-use growth management*	*Traffic-related measures*	*Pricing/financial measures*
1. Land-use and transportation coordination 2. Regional and local plans 3. Land-use policy planning 4. Development of analytical tools	1. Zoning regulations 2. Performance zoning 3. Phased development policy 4. Areas of critical planning	1. Improvements within the site: access improvements, internal circulation, parking facilities, demand management, provision of adequate parking arrangements, etc. 2. Road network capacity improvements: intersection, arterial road, and expressway interchange improvements, etc.	1. Impact fees 2. Negotiated development agreements 3. Impact exactions 4. Shared funds 5. Private sector contributions

Policy actions are needed at the Centre, State and local level. In the Mumbai Metropolitan Region, the gap in financial outlays required for infrastructure development and its actual allocations is huge. A major source for this increased demand for infrastructure is the need for transport. Citizens' need to travel huge distances between residences and places of work. Business and Industry are responsible for this increased transport demand. They have great potential to contribute to the sustainable growth of the Mumbai Metropolitan Region and should be co-opted to be part of the solution to address the gap in urban infrastructure financial allocations. Perhaps planners and business should encourage this vast MMR to congeal into dense clusters around transit stations rather than focusing entirely on high cost infrastructure projects. There is a crying need to comprehensively evaluate congestion in terms of its real impact.

Comprehensive Congestion Evaluation Framework

	Accessibility Factors	Impacts	Economic Efficiency	Social Equity
Major factors to consider in comprehensive evaluation	• Automobile travel quality • Quality of other modes • Roadway connectivity • Geographic proximity (land use density and mix)	• Traffic congestion • Road and parking costs • Accidents • Consumer costs • Mobility for nondrivers • Energy consumption • Pollution emission • Efficient land use • Public fitness	• Efficiency gains from favoring higher value trips • Possibility that induced travel has negative net benefit • Consumer surplus gains from new modes and services	• Fairness of benefit and costs allocation. • Impacts on physically, economically and socially disadvantaged people. • Unfairness of polices that favor automobile travel over other modes
Conventional congestion evaluation	Primarily considers automobile travel conditions; other accessibility factors are often overlooked.	Focuses on travel speed and vehicle operating costs. Other impacts are often overlooked or undervalued.	Generally ignores economic efficiency factors.	Generally considers a limited set of equity impacts.
Changes required for comprehensive evaluation	Consider all accessibility factors and trade-offs between them. Use multi-modal accessibility models.	Consider all significant impacts and planning objectives, including external costs and co-benefits.	Consider these economic efficiency factors.	Expand the range of equity impacts considered in evaluation.

This table summarizes major factors to consider in a comprehensive and multi-modal congestion evaluation framework. Conventional evaluation tends to overlook and undervalue many of them.

No doubt there is a value and need for smart solutions in terms of congestion reduction strategies:

Congestion Reduction Strategies

	Roadway Expansion	Improve Alt. Modes	Pricing Reforms	Smart Growth	TDM * Programs
Congestion impacts	Reduces short-run congestion, but this declines over time due to generated traffic.	Reduces but does not eliminate congestion.	Can significantly reduce congestion.	May increase local congestion intensity but reduces per capita congestion costs.	Can reduce congestion delays and the costs to users of those delays
Other costs and benefits	High costs. Minimal co-benefits. Tends to increase indirect costs by inducing vehicle travel.	Medium to high costs. Numerous co-benefits.	Low to high implementation costs. Costs users, generates revenue (an economic transfer) Numerous co-benefits.	Low to high costs. Numerous co-benefits.	Generally low to moderate implementation costs. Numerous co-benefits
Consideration in current planning	Commonly considered and funded	Sometimes considered, particularly in large cities	Sometimes considered but seldom implemented	Not generally considered a congestion reduction strategy	Sometimes considered, particularly in large cities

Different congestion reduction strategies have different types of impacts and benefits.

* TDM - Transport Demand Management

The Proposed Solution

Maharashtra had declared IT and IT enabled services policies 2003 & 2009. These have helped in development of IT industries in the State. The e governance initiatives of the State have matured. There exists a robust 3G and 4G data network. More importantly, the IT culture has taken root and has percolated down to the common man. A cursory analysis of most white collar work throws up an interesting fact. Most of this workforce lends itself well to the use of IT. Therefore, if the State focuses on strengthening the existing information network we could easily focus on more information flowing down the information highway (read information networks) rather than focus on building more highways.

The changes will not be readily accepted by the mindset of the past. Changing vehicles from horse carriages to cars did not happen overnight. Just like some people would rather call instead of writing a text message, there would be some that would still prefer driving to work. We should promote telecommuting and distributed work forces as we evolve with technology. When there was no car, people traveled on other slower vehicles to get to work. But if there is a newer vehicle that allows people to reach work faster and more efficiently, then they should start to use that vehicle instead of the old vehicle. Now the new vehicle of transport could seem odd, but it is composed of the Internet and the associated technologies such as e-Mail, Virtual Private Networks, Remote Desktop, Video Conferencing, and the World Wide Web. This new vehicle allows people to reach work instantaneously with high efficiency. The technology of the old world supports some industries while wrecking havoc on the over all health of the life forms including humans on earth.

As people become more accustomed to working remotely they will understand the benefits

that include:

- Reduce traffic and the costs associated with traffic congestion
- Less time spent doing nothing
- Less stress on workers promoting healthier, happier and more efficient workforce
- Helping the Earth heal from the massive amount of chemicals released from vehicles
- Bring more work-life balance into the workforce
- Work and other aspects of life becoming more integrated instead of being mutually exclusive
- Families becoming more cohesive as workers can share more time and experiences with their partners and children instead of being away most of the time
- Needing less office spaces and concrete thus reducing the human footprint on the environment

Everyone strives for economic, energy and environmental (**E^3**) improvements. With support from legislation aimed at enabling, encouraging, and incentivizing the use of current information technologies along with necessary policies, processes and procedures (P^3), we can by adopting this 'New Way of Working' turn into reality, extraordinary levels of accomplishment, quality of life, sustainability, energy efficiency and security, and create new job opportunities for all including rural, disabled, and older workers who will be able to work regardless of their location. Rather than relying on yesterday's industrial age business models and transportation modes, the way forward is to encourage interactions on the congestion-free, green, safe, energy efficient, and disaster-resilient 'Information Super Highway'. Therefore: $\mathbf{IT+P^3 = E^3}$

Now, of course, not everyone can telecommute. But there are many people who have jobs in offices in which almost all their work is performed in front of a computer and on the phone. Consider the benefits:

- savings to employers (overhead, etc)
- reduction in gridlock
- reduction in consumption of fuel
- reduction in pollution
- more time
- increased employee satisfaction
- improved productivity

Wikipedia defines a **virtual workplace as** a workplace that is not located in any one physical space. It is usually in a network of several workplaces technologically connected (via the Internet) without regard to geographic boundaries. Employees are thus able to interact in a **collaborated environment** regardless of where they may happen to be in the world. A virtual workplace integrates hardware, people, and online processes.

To engage in telework means to change the location of certain professional activities, from the organisation's conventional office to elsewhere. Remote working is not a new concept, but as Gray et al. note, telework is different because it relies on modern information and communication technologies (ICT).1 We define telework as paid work from home, a satellite office, a telework centre or any other work station outside of the main office for at least one day per workweek. ICT substitutes for work-related travel, but there need not be continuous, on-line communication.

Telecommuting Benefits		
The Employer	**The Employee**	**The Community**
Increased productivity	Decreased commute time, costs & frustration	Increased neighborliness
Reduced turnover	Increased flexibility and control over work environment	Reduced air pollution
Decreased overhead for office and parking spaces	More quality time with loved ones	Decreased traffic congestion
Improved recruitment and retention		Enhanced economic competitiveness

What Kinds of Jobs and Tasks are Suitable for Telecommuting?

Many different jobs lend themselves to successful telecommuting. The key is not in the job itself, but in the functions and tasks which the employee will be performing. Many jobs require at least some writing, reading research, editing, working with data (entry, processing, coding, etc.) or talking on the phone. In general, telecommuters should perform tasks that don't require significant face-to-face communication, can be accomplished independently and have clearly defined products.

Where we work, when we work, and how we communicate are being revolutionised, as a "seamless" web of electronic communications media—e-mail, voice mail, cellular telephones, laptops with modems, hand-held organisers, video conferencing, and interactive pagers—makes teamwork and mobility a reality. Not only is work becoming seamless as it moves between home, office, and phone, but it also is becoming endless as it rolls through a 24-hour day (Power Gizmos, 1997). To be viable, virtual offices require four types of information:

- Online materials that can be downloaded and printed
- Databases on products and customers that are accessible from remote locations
- Well-indexed, automated central files that are accessible from remote locations
- A way to track the location of mobile workers

By far the biggest challenge is performance management ("If I can't see employees, how do I know that they are working?"). This is not the same thing as performance appraisal, an exercise that many managers do annually to identify and discuss job-relevant strengths and weaknesses of individuals or teams. In contrast, performance management is part of a continuous process of improvement over time. It demands daily, not annual, attention.

At a general level, the broad process of performance management requires that you do three things well: define performance, facilitate performance, and encourage performance (Cascio, 1996). Like a compass, the role of the manager is to provide orientation, direction, and feedback.

In managing a virtual workplace, a second major challenge is communication. It is important not to over-rely on e-mail, which is one-way communication. In addition to e-mail, managers need to learn how to conduct effective audio meetings, and to balance e-mail, voice mail, video conferencing, and face-to-face communications. Industrial and Organisational Psychology will have to be applied to ensure success.

In summary, Telecommuting will become more integrated within society as people evolve while they benefit from it in many areas including the reduction of highway congestion. Increasing the number of people who telecommute would not completely eliminate problems, but it would be an effective part of reducing congestion **However, there will be numerous job functions that cannot adopt to tele-work. These will continue in their traditional form. Special clusters will provide for such work places. Large factories would therefore be located at the outskirts and would have their own mini townships.**

MMRDA or MHADA could be mandated to develop such clusters. It could also be mandated with developing special clusters which will accommodate work places equipped with required infrastructure to ensure that no one needed to travel more than 5 kms to their workplace. Such clusters would be established across the Mumbai Metropolitan Region. The number of clusters would be market driven and would necessarily be connected to information highway. Mantralaya could be also clustered across the MMR. Of the 110 layouts which MHADA possesses, 54 are large layouts of more than 1 acre and can be utilised for this purpose. MMRDA could also be tasked with the responsibility and authority to put in place a system to swap office/lands between businesses/owners. Such a system would necessarily need new legislation.

First Steps to Implementation

Undoubtedly, there will be stiff resistance from vested interests. The State will need to legislate to introduce this innovative solution. The legislation will give positive and negative incentives to all businesses thus ensuring that no citizen needs to travel more than 5 kms to work. Subsidies/rebates to organisations that participate enthusiastically, shared facilities for companies that move to the proposed clusters et al.

The proposed solution cannot be considered without a comprehensive study of the proposed solution by eminent experts from diverse disciplines. The first legislation therefore, has to be the constitution of such a committee with a proviso to take up for further legislation its report.

Government of India grants to State Governments, 80% of the cost of studying congestion in cities and considering implementation of new measures to tackle it. The Chief Minister in his address to the NDC meeting for the 12th five year plan had said: "I once again urge Planning Commission and Government of India to create a separate line of funding for addressing the challenges of mega cities. I request for a separate dedicated pool of funds, the access to which could be governed by totally different set of norms having specific relevance to the development of particular mega city. Last year I had introduced the concept of 'National Projects for Mega Cities' (NPMC) with an entitlement of 90% funding from the Centre. I would like to reiterate that guidelines may be formulated for introduction of NPMC at the earliest."

Experts who were involved in the planning of Thane and Navi Mumbai and who are well known in this subject can be part of an initial consultation to further explore the practicability of this concept.

The Local Initiative Facility for Urban Environment (LIFE) programme was launched by UNDP at the Agenda 21 Summit. The main goal of the programme is to help city dwellers to help themselves, to find local solutions to local problems. India is one of the 178 member states who were signatories to this programme. There also exist numerous multilateral and bilateral organisations that would financial support such initiatives.

SDNP: The Sustainable Development Network Programme is a UNDP initiative launched globally in 1990 to make relevant information on sustainable development readily available to decision-makers responsible for planning sustainable development strategies.In India there are several ongoing projects which are being implemented through various bilateral programmes. Some of these include CIDA, IDRC, OECF/Japan, JICA, and other bilateral cooperation programmes with countries inter-alia including U.K., Norway, Sweden and Germany.

The concept of "smart growth" emerged in 1992 from the United Nation's adoption of Agenda 21 at the UN Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil. Driven by urban planners, architects, developers community activists, and historic preservationists. It accepts that growth and development will continue to occur, and so seeks to direct that growth in an intentional, comprehensive way. smart growth principles are directed at developing sustainable communities that are good places to live, to do business, to work, and to raise families. Some of the fundamental aims for the benefits of residents and the communities are increasing family income and wealth, improving access to quality education, fostering liveable, safe and healthy places, stimulating economic activity (both locally and regionally), reducing pollution and developing, preserving and investing in physical resources.

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