Naya Dharavi
Nurture a community vision to plan a sustainable future
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Dear Sir/Madam,

Our utmost gratitude to the Urban Design Research Institute for organizing the Reinventing Dharavi International Ideas Competition in 2014. It has been a great pleasure working together with our team members towards this very inspiring endeavor, and it is a privilege that our submission was one of the six entries that received Honourable Mention.

This following summary document starts with three key questions:

1. **Who is Dharavi today?**
   A comprehensive look at the community first, and not just the physical conditions to understand what defines the spirit and soul of Dharavi and the entrepreneurial nature of its people.

2. **What could Dharavi be tomorrow?**
   A proposed overall sustainable development approach and masterplan framework that is incremental and context-sensitive, provides basic infrastructure and public services, yet puts the people first - allowing for the retention of social networks, informal interactions, livelihood and the preservation of the dreams and hopes of the people of Dharavi.

3. **How can we make it happen together?**
   By working together with Dharavi’s residents and various stakeholders and leveraging Dharavi’s strategic location, land, and people, Dharavi can be regenerated to become a healthy, liveable, and sustainable community that contributes to Mumbai, and beyond.

We hope that this serves as an inspiration and illustration of a potential future, most importantly to enable the community of Dharavi to engage in dialogue to develop a vision of their own.

Yours truly,

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Who is Dharavi Today?

Dharavi is home to one of the most dynamic and entrepreneurial communities in the world. It is also the most densely populated area on Earth, suffering from a lack of infrastructure and proper living conditions for families and workers alike. Dharavi is an amalgamation of neighbourhood clusters with migrants from all over India, bringing people of different states, backgrounds and religions together that all manage to live in relative harmony. It not only offers more affordable accommodation, but also creates real opportunities for livelihood.

The various informal interactions that take place in Dharavi create a uniquely distinct combination of economic livelihood for its residents. However, these contributions are, in part, the result of poor environmental, working and living conditions. There is a need to establish a framework in which the industriousness of Dharavi is retained and enhanced - characterized by social equality, environmental sustainability, cultural vitality and a better quality of life. Through incremental steps, the dreams and hopes of more than half a million people can be realised by creating a sustainable Dharavi.
Basic Premise

- Dharavi’s key resources are land and people
- All residents need homes regardless of cut off date
- A range of affordability for housing provision per family
- Industries and economic livelihood should be enhanced
- Basic needs and sanitation should be upgraded as needed
- A network of open space and community amenities is a need
- Solution space for any high-rise and high-density development should be limited to certain key nodes and areas
- Existing industries should be improved and sanitized and new clean and green industries should be introduced with higher quality standards
- Residents and other key stakeholders should be involved in the reinventing process
- Dharavi should promote a livable, walkable, healthy and sustainable lifestyle

To ‘Reinvent Dharavi’ is to provide a greater standard of living for all residents whilst ensuring that their livelihood is not compromised.

Dharavi’s Economic Contribution

Though the majority of its operations work within the informal economy, it is estimated that Dharavi contributes between US$500m to $1.5billion per year in economic output. The economic output of Dharavi accounts for approximately 0.4-1.2% of Mumbai’s total annual economic output (GDP). This is a considerable amount given that Dharavi’s economy is largely informal. Mumbai, India’s largest economy, accounts for 6.16% of India economy. Mumbai is also India’s fastest growing economies. As shown in the Figure, the economy has grown vastly and is set to more than double by 2025. Dharavi’s informal economy provides a range of essential services and products to Mumbai’s economy. These range from manufacturing of clothes, textiles, wood products all contributing to Mumbai’s growing manufacturing sector. Dharavi also provides important recycling functions such as reuse of cooking oil tins, paint tins, paper and plastics. This provides an important waste removal service to the cooking, construction and manufacturing industries and also secondary economies in the reuse of plastics and tins.

Contribution to Global Supply Chains

Dharavi’s in fully integrated into both local, regional and global supply chains. Products and services such as plastics and paper recycling created in Dharavi are used in the day-to-day function of Mumbai’s economy and leather goods, textiles and pottery are sold across India. Increasingly Dharavi’s products are being exported internationally through initiatives such as the Dharavimarket.com and Dharavi Brand.
Labour Force

Dharavi's residents provide Mumbai with an important source of construction workers, laborers, cleaners, drivers, secretaries and cooks, which are an integral part of Mumbai’s service sector. Within Dharavi there are a wide range of entrepreneurs in the manufacturing industries (i.e. recycling, pottery and textiles) and also many in the service sector, providing essential services such as education, health, community services retail and real estate.

However, most households earn less than INR5,000 a month (US$82) which is much less than the typical monthly income for residents of Mumbai which is more than INR12,000 (US$197).

Current Cost of Housing

Mumbai has some of the highest housing rents in the world – at Rs.30-70,000 per month (US$492-$1,148). Dharavi provides more affordable housing with its wide range of rents – some as low as Rs.185 (US$4) to rents which are more competitive with surrounding areas – at Rs.5,000 to Rs.10,000 a month (US$82-164).

Land Ownership Breakdown

Land in Dharavi has 9 main uses classes, and Residential Slums have the majority at 32.95%. Residential and Industrial have 14.86%, Roads are 13.89%, Industrial is 8.58%, Residential (Rehabilitated) is 7.55%, Residential and Commercial is 6.16%, Private Open Space is 5.56%.

Figure: Dharavi Landownership Breakdown

Household Income Overview

Household incomes in Dharavi range from almost nothing to INR18,000 per month.

Figure 2. Figure: Household Income Distribution
Role of Stakeholder Mapping

Stakeholder mapping is the process of identifying groups and individuals that are likely to be affected by the redevelopment of Dharavi. The stakeholder mapping process also sorts stakeholders according to their impact on the redevelopment and the impact it will have on them. This information is used to assess how the interests of those stakeholders should be addressed in a project plan, policy, program, or other action.

Key Players

Key players are those most impacted by the redevelopment and those who have the greatest influence and should be the focus of stakeholder efforts and should be regularly engaged throughout the redevelopment process: Dharavi Residents and Resident Representatives; Dharavi Businesses; Government; Developers; Investors; Citizens of Mumbai and Mumbai Business Owners

Residents & Resident Representative Views:

"We are afraid that our livelihood will be vanished," said some. "Redevelopment will harm community [in the] thousands if small businesses that operate in Dharavi," said some residents and charities. "It is essential for Residents to work from their homes in the new Dharavi" said Sundar Burra – A advisor to Society for the Promotion of Area Resources Center (SPARC).

Dharavi Business Views:

"Reconstruction of the whole industry chain will break Dharavi. Workers can work and sleep here," said Khurshid Sheikh - A Leather Shop Owner.

"Every Slum has a sale. Aircraft can't be manufactured here, but we can recycle airline cups, food containers and other waste," said Mobin – An entrepreneur “The revamp will help my business. More buyer will come” said one garment exporter.

Developer Views:

“There are three major economic variables: the cost of construction, expected market prices, and the cost of capital.” “We see the Dharavi Redevelopment Project (DRP) as a vehicle for us to change the lives of a very large number of people.” Dharavi Redevelopment Project

Government Views:

“This is the first time ever where after undertaking a project not only the developer but also the government and hence the city gets a share of the profit, which could be further used for its development,” said SRA.

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Baseline Review

Morphologically, Dharavi is a mix of interlocked informal and formal settlements, with the former being the predominant settlement. The informal parts have been built over decades by residents in a mostly unregulated fashion. The relative uniformity of these solutions reflect the spatial, structural and economical constraints. The formal parts are the result of development programs such as the DRP (Dharavi Redevelopment Project) and institutions such as SRA. The Slum Rehabilitation Authority has now dissolved, since the approval of the DRP.

Residential and Toilet Facilities

Public Infrastructure

Permanent Buildings

Industrial Premises

Naya Dharavi
Density Analysis

Dharavi is clearly a place with extreme population densities. Even compared to a number of known high-density places, Dharavi is denser still. Excluding the creek land, the built-up area of Dharavi is 220 hectares. Dharavi's 500,000 people result in a density (2,272 people per hectare) that is 175% that of the next densest place, the district of Mong Kok in Hong Kong, which has a density of 1,300 pph. In New York and Hong Kong, density is achieved through multi-storey structures, but other examples consist mainly of low-rise buildings with little open space, much like Dharavi. Dharavi's density can only mean that more people occupy a single household of the same size and/or that the average dwelling is much smaller and/or there is even less open space in the area. In addition to living space, Dharavi houses many active workspaces; space-sharing is inevitable. The graphic below shows the potential land coverage required for housing. With a population of 500,000, 10 sq.m. per household and 5 people per household, a total footprint of 100 hectares would be required (500,000/5 x 10 = 1,000,000 sq.m. = 100 ha.). With an average dwelling size of 15 sq.m. the required area would grow to 150 ha., and with an average dwelling size of 20 sq.m. the required area would be 200 ha. Many houses are over two storeys and space will given over to streets, alleys and other open spaces as well as non-residential uses.

Fig 3. Figure: Footprint Variations with Increasing Residential Floorspace Requirements
Proposed Government Plan & Concerns
The Slum Redevelopment Authority has been responsible for redevelopment of Dharavi and has prepared the Dharavi Redevelopment Project (DRP). DRA is the approving and monitoring Authority under the Ministry of Urban Development and Planning, State of Maharashtra. The Municipal Corporation of Greater Mumbai (MCGM) is responsible for deciding the eligibility of the slum dwellers. Currently Maharashtra Housing and Area Development Authority (MHADA) is responsible to redevelop Sector 5. The Government plan is for the rest of the 4 sectors is to be developed by the private developers and construction companies.

The current Government plan is a top-down approach that will result in wholesale redevelopment, large-scale uprooting of social networks, people’s employment and livelihood. Any positive change requires low to medium, but temporary, disruption that may cause nuisance. Some people or businesses may have to relocate in the interim but will maintain the opportunity to be within the larger Dharavi community.

Dharavi is a place of enormous variety – there are many facets that make it a unique place. There are many positive characteristics but clearly there are also a number of adverse aspects.
**Strengths**

- Self-made people, strong sense of community, multi-generational, hardworking, enterprising in nature;
- Self-built and flexible development, sense of ownership;
- NGO support, social networks, community participation;
- Strategic location, high potential land value;
- Education, awareness, moving up the social ladder;
- Recycling hub, leather, textiles, food and other industries offering economic livelihood;
- Integrated workspace, close to ground;
- Human scale, compact development, walkable;
- Sense of identity, vibrant;
- Economic contribution to the city;
- Close proximity to Mahim Creek.

**Weaknesses**

- Poor living and working conditions;
- Lack of basic infrastructure and utilities;
- Hazardous industries and pollution;
- Traffic congestion, pollution;
- Severe risk of flooding and environmental problems;
- Severe public health hazards;
- Lack of interaction between community and Government;
- Lack of community facilities, public space, open space;
- Isolated position;
- Poor built quality of structures;
- Lack of legal status for many people.

**Opportunities**

- The micro-entrepreneurial environment can be leveraged for upward mobility – to be unlocked with infrastructure improvement;
- A Community Economic Zone (CEZ) could unlock productivity through financing mechanisms;
- Strategic location is a long-term asset;
- Existing co-operative developments could be further enhanced;
- Regularise and expand recycling hub;
- Technological innovations could improve living and working conditions in Dharavi;
- The function as an incubator could be enhanced;
- Adjacent mangrove and nature as conservation areas, integrated with Dharavi;
- Innovative concepts in transportation and preserve walkable networks.

**Threats**

- Government plan is seen as pressure to move people and livelihoods out of Dharavi;
- Proximity to Bandra Kurla Complex poses redevelopment pressure;
- Land ownership issues;
- Legacy of SRA’s piecemeal redevelopment;
- Legacy of poor construction ill-suited to the needs of the people;
- Low-lying land poses continued risk of flooding and environmental problems;
- Lack of interaction between community and Govt;
- The dense morphology means difficult emergency access.

**A Few Key Themes**

Based on these findings, some key themes can be distinguished as a focus for a better future for Dharavi and its residents:

1. Health
2. Legal Status
3. Industriousness
4. Human Dignity
5. Sense of Community
What could Dharavi be Tomorrow?

“Naya” Dharavi is a potential framework that offers a higher standard of living for all the residents that ensures and maintains their economic livelihood by building on the strategic location of Dharavi and entrepreneurial nature of its people. The aim is to create a Naya Dharavi that provides opportunity for the community with proper infrastructure and economic clusters to function well within yet is well integrated with the surrounding areas and truly becomes an integral part of Mumbai. The purpose is to ensure a cleaner, brighter and dignified future for all residents of Dharavi while addressing the needs of the community, the city and the country.

The proposed framework is based on the Five Pillars of Naya Dharavi:

1. **Envision**: Social uplifting; the people of Dharavi as a part of a fair, inclusive and democratic system; a development which forms a balance with live, work, play and cares for its environment; a Mumbai which has environmental sustainability at the core of development decisions.

2. **Facilitate**: A robust institutional framework; community engagement through the DDC; a long-term planning horizon with 80-year leases; a stakeholder framework where everyone has an equal share.

3. **Create**: New economic value; a Dharavi that couples commercial prowess with community well-being; opportunities to upgrade current industry and jobs; a community economic zone (CEZ) as a sustainable model for Slum Area Regeneration.

4. **Build**: Integrated development; a multi-faceted infrastructure to cater to future demands for an integrated Dharavi; affordable homes that are safe, resilient, healthy and enjoyed by the community; decent basic utilities and sustainable transport for a connected, walkable and reliable Dharavi.

5. **Realise**: A viable future; home ownership through the Resident Purchase Scheme and make their residency legal; shared funding and equity from public, private community and NGO interests; a land development policy that can generate finance without compromising the interest of its people.
Objectives:

1. Develop a long-term strategic planning framework as a guide for development.
2. Involve local residents, NGOs and businesses as much as possible.
3. Minimize preventable diseases, including exposure to harmful substances.
4. Ensure Dharavi is a safe place to work and continues to create livelihood.
5. Integrate Dharavi with surrounding areas as an integral part of Mumbai.
6. Create the foundation to build a bright future for current and future residents
7. Make Dharavi a sustainable community that is socially acceptable, environmentally friendly and economically viable through education and awareness programmes.
8. Ensure that Dharavi is home for all segments of society and contributes to the city, country and beyond.
9. Empower the people of Dharavi to envision and build a future together!

Development Parameters

1. Existing Dharavi population is 500,000
2. Per capita income of Dharavi is Rs.5,000/month
3. Range of flat sizes to be provided 30 sqm, 40 sqm to 50 sqm max
4. The flat size is based on workers/tenants, residents after cut off date and residents before cut off date
5. Optimum Land Use Distribution
   a. Residential - 50%
   b. Industrial - 20%
   c. Office – 10%
   d. Retail/Commercial use - 15%
   e. Institutional/Community use - 5%
6. Prospective Land Coverage
   a. Site coverage – 55%
   b. Road footprint - 15%
   c. Open space - 30%
7. Density is predominantly low to mid-rise high density
8. Low rise - 4 to 6 floors (with ground and upper floor for work, retail, community)
9. Medium-rise high density - 6 to 12 floors
10. High rise-high density - 12 to 24 floors
11. Overall FSI of 4 maximum
12. Land is leased on an 80-year lease with option for renewal
13. Residents pay for their accommodation, industrial and work space
14. NGO, Public, Private Sector contribution with land and funds
Guiding Principles
1. Adopt a collaborative, place-making and sustainable development approach
2. Create a walkable, pedestrian and transit oriented development
3. Develop high-density low-rise structures in the core area of Dharavi
4. Limit high-density mid-to-high-rise development in the periphery of Dharavi and high-rise development at specific nodes
5. Integrate and upgrade community facilities and a well designed landscaped open space network
6. Incorporate an educational hub to create awareness among the people of Dharavi
7. Highlight art and culture throughout with opportunities to showcase Dharavi’s heritage
8. Introduce new industries such as clean energy, high tech, prefabricated and other green building materials to ensure and maintain livelihood of the people of Dharavi.
9. Restore the environment by converting the local mangroves into a nature reserve
10. Use innovation, sustainability and green infrastructure as the back bone to the whole development

Stakeholder Engagement
Reimagining Dharavi as a walkable, liveable and sustainable community that caters to the needs of current and future residents will take a comprehensive development plan that is based on enriching livelihood with the following focuses: Community, Infrastructure, Education, Transportation and Commercial Viability. A key consideration, before any development happens, is to possibly set up a Dharavi Development Corporation (DDC); 75% of the members of which would be members of the community, and the remaining 25% of the members made up of individuals from the city and the state, along with professionals, academia and other industry leaders from the private sector. The DDC will be tasked with developing and managing the Dharavi Regeneration Plan for the next 86 years, as the land will be leased for a period of 80 years to residents and investors.

Leveraging the Community for the Better
Building on existing societies and communities and streamlining the overall structure will make it possible to create a Community Cooperative Program so that volunteer work is generated and nurtured among both residents as well as individuals and students from neighbouring areas that will work together in the rebuilding process.

Infrastructure
The first task is to clean up the existing environment, including streetscape, gutters etc. Then green infrastructure can be developed; first providing proper drainage, water supply, electricity, and then us renewable resources like solar energy.

Education, Training and Collaborative Construction
Creating opportunities for education and awareness by way of building a new educational hub will offer Dharavi residents and a place for their children to go to school and a place where they themselves can get trained in vocational techniques, such as computers, construction, trades etc. A green construction factory for building materials such as bricks, stone, blocks, prefabricated units etc., could spearhead this effort while serving as the source for material needed in regenerating Dharavi.

Transportation Improvements
Improving the road network in an incremental manner by adding missing links, like those needed at the eastern edge of Dharavi along the rail tracks under the high-tension wires, will be the least disruptive. Improvements to the overall transit network builds on the existing railway network and two stations, adding a bus network including a Dharavi electric bus service that improves mobility, accessibility and provides better connections to surrounding areas.

Commercial Viability
The plan envisions a solution space of commercial intervention at areas of least resistance where people are favourable to regeneration to support the success of the overall regeneration of Dharavi. This should be in the form of higher density high-rise sited at key nodes. Sector five housing can then be developed as per the Current Government Plan, but done in a more sensitive way, absorbing Rajiv Gandhi Nagar and the Transit Camp.

Phased Development
Phase I: Immediate Term – 2014-2020
Phase II: Short Term – 2021 - 2030
Phase III: Medium Term 2031 - 2050
Phase IV: Long Term 2051 – 2080
Phase V: Longer Term 2081-2100

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Dharavi’s informality is one of its treasures

The current settlement is the product of the exchange between permanent and temporary residents, who over decades and generations, have shaped Dharavi with the complexity of their needs and their relationships. This complexity can only be addressed by the involvement of a plurality of actors, including residents, local NGOs and formal and informal forms of association of residents. Any pure top-down and centralised approach will fail to safeguard the achievement of the current area and will always fall short in the immensity of the task of trying to improve the life of more than half a million of inhabitants.

With a plurality of actors comes a diversity of interventions

The master plan aims to be a framework within which many possible approaches, private, collective, public, planned and designed, informal and spontaneous etc, will contribute to the development of the area. The framework should guarantee a balanced mix of big development driven by market forces or government funding and smaller scale interventions driven by locals and private residents.

Delivery versus partnership

Avoid the “delivery” paradigm (top-down development). It is the community and the local residents who, within the guide of communal frameworks, have the power and the knowledge to improve the current situation.

The government’s role is to support

The role of the government is to guide this process within a framework of regulations and incentives and to support it with investments in the primary infrastructure.

Incremental upgrading

The proposal is a long-term strategy framework, aimed at creating the conditions a balanced mix of spontaneous and planned improvement over the span of many years.

A “fine grain” approach

Local interventions coordinated with the local community instead of centralised big projects (except for infrastructures) In this way we try to guarantee the involvement of the residents, promote a sense of responsibility towards their local environment and promote the complexity of the city.

The “fine grain” approach and the incremental upgrading are strategies that favour slow and diffuse upward social mobility of the residents rather than a sudden improvement for a relative minority of people. From a morphological point of view, the fine grain approach aims to safeguard the complexity and the diversity of the current situation and at the same time promote an incremental development of the area.

The proposed framework adopts a sensitive, place-making and sustainable development approach, keeping in mind the following:

1. Dharavi’s informality is one of its treasures
2. With a plurality of actors comes a diversity of interventions
3. Delivery versus partnership
4. The government’s role is to support
5. Incremental upgrading
6. A “fine grain” approach
Integrated Development with Nodes and Clusters

Dharavi’s industriousness and productivity takes place in a very informal way with a very intricate mix of uses. Work places are located throughout the area and, in some cases, the factory floor is used at night for sleeping. While sustainable in a way by minimizing the need for transport, these systems clearly pose a heavy toll on human living conditions. In particular, industries that deal with toxic fumes and hazardous materials should be located at a safe distance from homes.

The masterplan includes measures to retain the benefits of mixed uses whilst addressing adverse impacts of certain industries that produce air, noise or light pollution, foul smells or excessive vibration. Dharavi’s current clustering of industries has many benefits, for example businesses can easily share knowledge, raw materials or employees, and buyers can more easily compare goods and products. The plan retains the idea of clustering and proposes to reinforce a focus on recycling and sustainable development. These nodes will be used as catalysts for transformation and new economic development.

Dharavi is centrally located within Mumbai but as a result of railway lines and Mahim Creek its position is somewhat isolated.

The masterplan applies the principle to create a hierarchy of roads, which is reflected in the hierarchy of spaces and building density. Along big roads, Dharavi will be more open, buildings will be taller and traffic faster and more intense. Within the different sectors, roads get smaller, the traffic is reduced and the building height decreases, down to the inner areas where traffic is mostly pedestrian and buildings are kept between ground plus three to four storeys. The low-lying areas will have buildings raised one level above ground to address flooding issues. This method will allow an increase of the overall density of the settlement without compromising daylight and ventilation and maintaining its spontaneous character.
A Framework for the Community to Envision a Master Plan

A framework is proposed for the community to collaboratively envision incremental changes to the urban fabric to enable a better future for Dharavi. This is not a wholesale master plan change from the existing situation.

This proposal could be the tool to coordinate and study the major infrastructure works that require a direct public investment such as road network, sewage, public transport, etc.

Zoning

After recognition of the pros and cons of the centralised and the bottom-up approaches and their differences, a framework is proposed where these two forces can work together in synergy, one complementing the other. The central idea is to favour the bottom-up approach in the central area of Dharavi and to create external areas where the planned, market driven approach is given priority. Therefore two zones are identified:

- **Zone A**: Central Dharavi – lower density, bottom-up approach based on sectors defined by classes of roads
- **Zone B**: Peripheral areas – high and medium rise development

To provide more open space, a variety of building typologies are proposed to suit different housing requirements in recognition that all people and households have slightly different needs and ambitions.

Naya Dharavi can be an example of how inner urban areas can contribute positively to the city and society they are part of. The ultimate goal of the plan is an incremental upgrade of the city environment guided by the local community, coordinated by the government and combined with market driven interventions and public investment.

The incremental upgrade concerns topics such as:

1. The density of the building environment and the distance between buildings
2. The quality and safety of the buildings
3. The number and the size of amenity spaces such as public spaces, cultural centres, etc.
4. The liveability of the environment in terms of mobility, social interaction, level of pollution and sense of dignity and participation for the residents.

Hierarchical Road Network

The masterplan includes a multi-faceted road system hierarchy that could be implemented over time in order to give people in Dharavi more options to get to where they want to or need to go. Part of the risk of a quick development driven by a limited number of subjects and with big, top-down planning, is the loss of the current complexity of the built environment and the creation of a city with no public and outdoor spaces, where life happens only in buildings and where the communal element is overlooked.

A social and sustainable model where there is a clear hierarchy between spaces of different function and where the built environment reflects this:

- Main roads will be the spine of the infrastructure including the sewage network, the cable network and an eventual public transport network
- Roads create a hierarchy of spaces and accessibility, giving the character to the different areas (traffic areas and fast movements, pedestrian areas and slower mobility)
- They drive the development based on maximum density and maximum building heights allowed according to the different classes of roads.
Roads R1 and R2
Roads R1 and R2, being part of the big infrastructure plan, are planned and delivered by the authorities but ideally approved with some degree of public consultation.

Roads R1: these roads are the main vehicular roads connecting different sectors within and beyond Dharavi. These are existing roads (like 90 ft or the T-Junction Sion Road) or newly designed, based on the DRP scheme and divide Dharavi in different sectors; each sector becoming a unit to coordinate the design on the local level.

Roads R2: These roads are secondary vehicular ways; they serve the traffic between different sectors and connect transversally the roads R1. Heavy traffic is not allowed.

R3 and R4
Roads R3 and R4 will be designed based on a local approach with public consultation and approval and will be developed along and accordingly with the upgrading of the building stock.

Roads R3: These roads are local vehicular and pedestrian accesses to the internal parts of the sectors. They serve local restricted traffic and emergency vehicles. These roads are identified within the existing urban fabric with the involvement of the local community.

Roads R4: These are smaller roads than R3 are categorised as R4 and includes backstreets, alleys and semi-private roads with no vehicular traffic. These roads are planned on the micro level and are mainly for pedestrians.

The proposed hierarchy of roads will be reflected in the hierarchy of spaces and building density. Along big roads, the city will be more open, buildings will be taller and traffic faster and more intense. Moving inside the different sectors created by this first subdivision, roads get smaller, the traffic is reduced and the building height decreases, down to the inner areas where traffic is mostly pedestrian and buildings are kept between two and three storeys. This will allow to increase in the overall density of the settlement, with the benefit of high density (more units, therefore cheaper, possibility of trade profit for dwellings with privates) without compromising daylight and ventilation and maintaining areas where the spontaneous character of the settlement is safeguarded.
Walkability and Open Space

Walking is the most sustainable mode of transport with the highest health benefits and the masterplan includes measures to stimulate walking. Central for these plans is a network of green spaces and linkages. This green network is expressly designed to be away from the main roads to provide convenient journeys.

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At the same time, however, the roads within Dharavi are not completely given over to motorized traffic. The roads within Dharavi will still be accessible and crossable by pedestrians, bicycles etc. Currently Dharavi lacks open space especially given the extremely high population density. The proposed masterplan includes a variety of building typologies and heights to enable a higher provision of open space.
Starting at the Neighbourhood Scale: Case Study: Sub-Sector 4D

As an example of possible planning and development, the Sub-Sector 4D has been considered. This area currently sits between 90 Feet Road and Mahatma Gandhi Road (considered in the master plan scheme as R1 roads). It runs approximately north-to-south and is lined by two R2 roads, running east-west, that serve as connections.

The area has high density in the proximity of an SRA Development and the Municipal School, with toilet facilities spaced evenly throughout. Temples, located at various locations in the site, serve the population well. That said, the area itself is characterised by informal development, an irregular and complex urban fabric, few public spaces and no green areas.
1. Existing Road Network Analysis

There is a high number of commercial activities, mainly, but not only, distributed along the two main roads - 90 Feet Road and Mahatma Gandhi Road. Beyond these, there are two other large roads that are not fully developed and do not cut across the site where commercial activities concentrate. The remaining roads are irregular and with little hierarchy.

2. Cluster Analysis

The analysis of the numerous associations of different kinds that are present in the city can be overlapped with the morphological analysis of the urban fabric to create blocks of physically adjacent buildings with a common social identity and development schedule.

3. Possible Traffic Network Proposal

The R3 Road Network is low traffic and allows penetration within the sub-sector for small deliveries, assistance and emergencies. It serves the local sub-sector only and therefore it is locally planned and locally implemented. It should be designed identifying and strengthening the existing road network, making rational adjustments when necessary. Shown to the left is a possible outcome of this prospective consulting process between public institutions and local associations in defining secondary traffic roads and the location of public services, temples and green / public spaces.

4. Proposed Traffic Network Density

The road network identified in this consultation / planning process also defines also the different zones R1,R2,R3,R4 with the relative values of maximum height (H), maximum FSI, percentage of public space (P), etc.

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Neighbourhood Scale Development Scenario: Phase 1: Public/Private Scheme and New Infrastructure

Based on the previous analysis and proposal, the following diagrams aim at illustrating a possible scenario of development. Although presented in a sequence for clarity, the following diagrams are not a phasing of a development but an illustration of a possible progress by subject. The first development presented is the only one that actually needs a more planned approach. It involves the creation of the new traffic network and the densification of the built environment along the two main roads R1, the 90 Feet road and the Mahatama Gandhi road, by joint forces of the public and private. After the identification of the path of the new roads, to be decided by the public authority in conjunction with the local institutions and based on the existing urban fabric, the scheme used to finance the development could be the one proposed for the Dharavi Redevelopment Plan, where privates are invited to build new buildings, incentivised by an increase in the buildable surface. The surplus of surface resulted after the construction and after accommodating all of the people displaced by the development, could be sold at market prices. The idea is that the residential and commercial surface destroyed in the making of the new traffic network will be offset by the new development, and the new surface created by the drastic increase in the density, sold at market prices, will finance the infrastructures and provide profit for the private investors.
Phase 2: Development Along the R2 Road Network

The creation of the R2 Network provides two fronts where an increase of density is possible. Here the development is left to local institutions and associations and relies on the spontaneous economic and social forces and the application of schemes, such as SRA.

Phase 3: Development Around Public Space

The areas around the public spaces within the site have given the development specific characteristics. The creation of green areas and squares reduces the availability of building surface. In order to guarantee that a reasonable ratio of building / open areas is maintained, the density allowed around this public areas is increased compared to the average of the inner zones of the sector. Therefore the clusters of citizen willing to develop around a garden or a public square will compensate with extra buildable surface.

Phase 4: Development Along the R3 Road Network

Phase 4 is a more localised development with residential buildings, local commerce and local services and amenities along the R3 Secondary Road Network.

Phase 5: Incremental Upgrading of Building Stock of the Existing Informal Settlement

Similar to the Phase 4, in Phase 5, the current existing building stock will be gradually improved according to private and public resources and needs. In the long-term is to allow building upgrades with both large-scale and small-scale intervention. The urban fabric should be developed considering the existing form - taking into account different hierarchies of spaces and increasing the amount of open space and facilities available.
3D Neighbourhood Development Scenario
The current settlement as it appears now, with a prevalence of small huts between two and four storeys, very narrow streets and little public space. On the other side it present a very fine grain that makes the city walkable and socially very active.

As time passes inside the development process, so does the scale of development. The upgrading of the existing should take many forms, from a larger scale settlement on big roads to a finer grain on secondary and tertiary road network, to the preservation of some of the current settlement but with an upgrading of the buildings.
Overall Masterplan Development Framework
The proposed master plan builds off the Neighbourhood Development Scenario in an incremental, phase-by-phase, approach as shown below:

Phase 1

Phase 2

Phase 3

Phase 4
Self-upgrading of Core Units
In this case a core unit is delivered for each household. This unit is designed to provide an expandable structure with a core of services such as bathroom and kitchen and the very minimum of living space. In this way, with small investment, households are provided with the very basic services and are then free to self-upgrade the core unit depending on needs and resources availability. (In the diagram the grey parts are the built cores delivered by builders and in dots the parts self-built)

Micro-Apartments
These are pre-fab stackable units corresponding to the minimal living space of 27-30 sqm and including core services as bathroom and cooking facilities. These units can be the way to upgrade existing huts with small-scale interventions or can be stuck one on top of each other to form bigger typologies such as urban blocks or courtyard houses. A local industry for the production of these units should be incentivised and after an initial public investment it could become a self-fuelling business.

Tower
The tower can be housed to sensibly increase the density of an area in order to accommodate residents relocated for building infrastructures such as roads or public green and squares. It should be used mainly along big roads R1 and R2 and avoided in areas with a finer grain urban fabric. The ratio of commercial/residential space is reduced because of the small footprint, but the tower can also accommodate spaces for offices.

Self-Incremental Upgrading
This type of upgrading is delivered by single residents on a small scale and mostly individually and it includes the refurbishing, rebuilding or upgrading of existing huts, with the possible intervention of local builders.

Courtyard Block
This is the direct development of the urban block wrapped around an internal courtyard. The size of the courtyard can vary from a relatively small light well to a wider communal space that can host production and warehouse functions.

Urban Block
This is the very basic typology for collective interventions of medium and large scale. Vertical circulation is either internal or external to the block and the horizontal distribution to the apartments is external through passageways. These also provide for external and communal spaces for the flats.
Green infrastructure and design are likely to be critical elements in the redevelopment of Dharavi.

Power Supply
The industriousness of Dharavi is encouraged in the plan but the productivity of the industries will depend on a steady power supply. A variety of renewable energy sources or technologies will be applied. Considering the large amounts of solid waste generated in the neighbourhood, biogas production is a promising direction to consider. This strategy not only will produce fuel, it will also ease the burden on landfill sites. Solar heating can be used to warm water so that less power is required to bring water to a boil. Solar power is becoming more affordable each year and can be used for local consumption. The higher structures could be used for limited production of wind energy. Technologies such as recycled plastic bottles filled with water and bleach can be used as an inexpensive way to illuminate indoor areas.

Water Management
No life can exist without water and when the available water is contaminated the conditions for life are dramatically worsened. Due to the lack of a proper system of utilities, poor maintenance and open drains, freshwater supply is often contaminated with sewage through the cracks of old and rusty pipelines. Water pipes are also often overwhelmed by garbage disposal sites, which are often contaminated with hazardous materials.

The proposed Dharavi Development Corporation, through community engagement, will be able to establish a renewed system for fresh water that will be sealed from contamination and that will reach every neighbourhood. The new pipes will be bright blue to avoid confusion with fresh water pipes. In addition to improving the provision of municipal drinking water, deep tube wells will be offered as an option to provide for freshwater supply, as these deep tube wells are not contaminated by ground water pollutants.

Drainage and Waste Management
With each monsoon season or heavy rain the low-lying land of Dharavi is under threat of flooding. The current system of shallow open drains and lack of run-off capacity results in flooding and of dispersal of hazardous waste, as well as human waste, in the open air. The pollution of surface and ground water is a serious threat to human health. The masterplan includes two new major sewage pipe lines and a number of smaller sewage pipes. These pipes, all grey in colour to avoid confusion with fresh water pipes, can be provided at the same time as the new water pipes. The new pipes will have a steeper gradient so that, through gravity, any waste will be carried to the two new sewage treatment plants at the border of the marshes along the Mahim creek. Waste will be filtered and treated and pumped into the creek. The mangrove marshes between the creek and Dharavi is an interesting eco system, offering habitat to certain bird species. The plan retains this as a natural resource. Limited access could be provided for educational purposes on the eco system and its place in Mumbai. In the lowest lying areas, housing on stilts will be considered in response to potential flooding in the area.

In terms of dry waste, Dharavi plays a big part for recycling and therefore minimize the load on landfill sites. Mumbai generates approximately 7,025 tonnes of waste per day. Studies shows that Dharavi accumulates a significant variety of waste released from tanneries, plastic units, scrap yards and through incineration of solvents and e-waste. (i.e. NEERI). About 80% of the dry waste generated in the city is segregated for recycling into reusable products. In addition to proper rain water run-off a system of underwater tanks can be used to store rain water as extra capacity. In case of excessive rain the sewage system will not immediately be under threat of overcapacity. Rainwater in these tanks can also be filtered and used for drinking water.
Air and Noise Pollution

People living and working in Dharavi suffer from the exposure to air pollution: Air quality is severely affected from the pollution arising from smoke from brick kilns within the neighborhood; toxic fumes from melting plastics and other non-organic materials; foul smells from open drains and gutters; municipal garbage dumping sites; and other domestic industries and traffic. In a pollution study of Dharavi by the National Environmental Engineering Research Institute (NEERI, November 2010), 551.7 microgram/metre cube (ug/m3) of average suspended particulate matter (SPM) was found, a figure more than five times higher than the permissible limit set by the Central Pollution Control Board (Ghanekar, N. Hindustan Times, Mumbai, February 04, 2013).

Illegal incineration of electronic waste, copper wires, PVC pipes, plastic, paper and chemical dyes generates toxic smoke which impacts residents’ health as well as a threat to mangrove habitat.

In addition to air pollution, Dharavians are subjected to near-constant noise pollution due to, for example, trash metal industries. Absence of zoning and haphazard developments of residential and small-scale industries and restaurants has created harsh living conditions.

The masterplan also proposes to include measures to establish regulations for air and noise pollution. Industries that deal with toxic fumes and materials will be encouraged to treat their emissions, manage their waste disposal or relocate away from residential properties.

Given the context of extreme population density – nearly 2500 people per hectare – it is clear that sustainable development is a key issue in Reinventing Dharavi. All resources, including water; electricity; air; food as well as space and human resources, must be used very efficiently to avoid a complete breakdown of living and working conditions.

Sustainable Development

The current situation is very challenging:
- Insufficient fresh water supply to meet the needs of the population
- Widespread contamination of the freshwater supply
- Insufficient run-off of rain water
- Insufficient capacity of sewage discharge
- Inadequate waste disposal
- Untreated emission of toxic fumes
- Discharge of hazardous waste in open drains
- Widespread noise pollution
- Unpredictable power supply

Sustainability in this sense comprises many issues and topics. Social sustainability, economic sustainability and cultural sustainability will be dealt with in other sections. The main environmental sustainability issues include Water Supply; Waste Management; Power Supply; Air and Noise Pollution; and Ecology and Green Infrastructure.

The of the principles of our plan is efficient use of resources coupled with basic parameters for decent living and working conditions. The proposal seeks to strike a balance between industriousness and human conditions, between economic viability and cultural vitality. The term ‘Sustainability’ is taken in the broadest sense and the overall aim is to develop community wellbeing. As such, a ‘quadruple bottom line’ is sought, with Community Well-being the result of Social Equality; Cultural vitality; Economic Prosperity; and Environmental Sustainability.

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Mangrove Nature Reserve

The mangroves at Mahim Creek near Dharavi can be restored with community input and developed as a Mangrove Nature Reserve that can create environmental awareness and restore the ecology while providing additional business and employment opportunities for the residents of Dharavi and Mumbai.

This can be organized as part of a community development program by an NGO interested in environmental sustainability. An environmental and recreational centre will be developed to link between the Mahim Park and form a beautiful natural edge to Dharavi creating a new green image and identity to Dharavi.

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How can we make it happen together?
The greatest challenge for the financial and implementation strategy is land ownership.

In other areas of the world government provides (hypothecates) land at low or zero market value for a specific period of time, as their contribution to meet social, environmental and economic objectives. The land revenue forgone is likely to be recouped through greater taxes from economic growth, or gained indirectly through increase in values in neighbouring areas etc.

The financial strategy assumes that private land is purchased by the government and together with the publicly owned land is hypothecated to the Dharavi Development Corporation for a lease period of 80 years. Costs of construction are borne by developers or utility service providers.

The Dharavi Development Corporation would be able to fund the redevelopment of Dharavi with minimal social disruption. DDC will be a brand people understand is for the betterment of their society as a whole.

Denizens should not feel like they are at the mercy of a huge, faceless corporation that they cannot communicate with or have any say in its operations.
Flow of Funds

The Dharavi Development Corporation sits at the centre of all fund flow and through specific funds, residents and business owners rent their dwellings and premises, or buy them over a period of time. Utilities are provided by third party companies and paid for through user charges.

The DDC offers governmental control while allowing capital to flow swiftly through to those in need. Through these mechanisms, the people of Dharavi can work towards a better future for themselves and Dharavi overall as investors of the community.

Dharavi Residential Purchase Scheme

The proposed residential purchase systems for Dharavi combine adequate incentives for small scale private sector developers to build appropriate dwellings and a purchase scheme mechanism funded by the developer to enable people to afford their home. Dharavi residents are not ‘one size fits all’ in terms of affordability. The proposed scheme embraces affordability, choice and flexibility:

- Those who can afford can buy if they choose to
- Those who cannot afford or prefer not to buy can rent
- Others can choose part rent, part buy and/or gradually buy as affordability changes.

Dharavi Community Managed Fund

- Sells or rents dwelling at market value (excluding land costs)
- Developer builds dwellings (with a profit margin) at a cost of Rs.13,000-16,000/square metre
- Dharavi Community Managed Fund lends 0-80% of principal at terms of 15-25 years. Interest rates vary on monthly household income with households with less Rs.5,000 per month charged 2.5% interest and households with more than Rs.5,000 per month income charged at 5%. Alternatively at 20% rental subsidy can apply to low income households.

Naya Dharavi
1. Operated and managed by a **Dharavi Community Managed Fund** which lends money to households
2. Sells or rents dwelling at market value (excluding land costs)
3. Developer builds dwellings (with a profit margin) at a cost of Rs.13,000-16,000/square metre

Dharavi Community Managed Fund lends 0-80% of principal at terms of 15-25 years. Interest rates vary on monthly household income with households with less than Rs.5,000 per month charged 2.5% interest and households with more than Rs.5,000 per month income charged at 5%. Alternatively at 20% rental subsidy can apply to low income households.

**Low Income Households**
- Pay only rent
- Rent subsidies available from Dharavi CMF if required

**Medium Income Households**
- Access to loan to own 50% of property and rent remainder
- 100% of loan from DCMF
- 25 year loan
- 5% interest rate

**High Income Households**
- Access to loan to own 100% of property
- 100% of loan from DCMF
- 20 year loan
- 5% interest rate

In order for Dharavi to develop in a sustainable and socially responsible manner, it is important that the base of entrepreneurial activity is supported and new businesses are encouraged, but in a manner which complies with relevant business legislation, provides a safe and fair working environment for all workers, yet does not increase costs so much to the point of decreased business profitability.

As Dharavi and Mumbai mature, it is likely that some of these businesses will adapt or even close, replaced by others, seeing opportunities in the market.

The concept is never to hold on to businesses because of nostalgia or force them to become dependent on subsidies but to enable the entrepreneurial spirit to thrive.

A ‘Community Economic Zone’ based on the framework of the Special Economic Zone is proposed as a mechanism which can help Dharavi businesses transition towards formalisation.

The SEZ model has been relatively successful in India and can provide a framework for a modified type of economic zone which incentivises investment, job creation and economic activity, and meets the objectives of Dharavi.
The Business Implementation Mechanisms for the Community Economic Zone include the following:

The underlying principle is that businesses are supported through the transition process over a five year period in order to meet the objectives of the Community Economic Zone.

1. Register businesses within Dharavi and ensure compliance with relevant business regulations within five years

2. Establish a Dharavi Business Welfare Fund (funded through tax contributions of Dharavi Businesses) to provide support to workers, minimise worker exploitation and enhance workers' health and safety

3. Establish a Dharavi Green and Clean Businesses initiatives supported by NGOs to promote information on reducing pollution generated by business and provide access to grants

4. Establish Dharavi Business Promotion Group to support branding and promotion of Dharavi to wider markets in Mumbai, India and globally
The Five Pillars of Naya Dharavi

1. Envision Social Uplifiting
2. Facilitate A Robust Institutional Framework
3. Create New Economic Value
4. Build Integrated Development
5. Realise A Viable Future

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