# Indicating Circular Logic: An Argument for Efficient Infrastructure

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The constant trickle of time flows into months and years, where we find successful instruments of the past have eroded into ancient artifacts of our heritage. Public infrastructure is not immune to the passage of time and falls under more intense scrutiny than those instruments of the private world. The degradation of public spaces and processes are challenges that plague every State without exception, as it is a fundamental attribute of nature. Old pipes rust into dust, old buildings crumble into sand, and old ideas evaporate into passing winds. Roadways are especially prone to disintegration, suffering from shifting grounds, incessant beatings from vehicles, and the extremes of weather. Despite the entropic nature of the world, we can design methods that remain useful and productive for longer periods of time to benefit ourselves and many future generations by way of intelligent design. One such shift from chaotic design to a more useful, harmonious design is through applications of the circle shape. Circles are easy to implement, are not disruptive to flow, easy to repair, transition into and out of, and easy to navigate and manage.

First, to transition our designs into a circle, society must transition away from old designs. Currently, the most common method for design is a grid. For example, there are electricity grids, city grids, transport grids, and so on. For society's modern purposes, grids are inefficient. Common sense states the fastest route from point A to point B is a straight line. However, that’s for linear movement. Modern society oscillates from place to place and then returns to the starting point after the day has expired. An oscillation is cyclical by nature, which provides the foundation for alternate designs. The potential for other patterns than grids especially arises when the number of individuals in an area increases so that travel is unbearable. Congestion, in this case, is due to many crossing paths of navigators. The situation worsens exponentially when all travelers must reach a common point before departing into individual paths, like intersections. Similarly, navigating from any given point to another on the grid system may require a series of unintuitive position changes, which become still more complex with the confusion and rush of traffic in a city context.

To continue, rectangles have no point from which all points can connect, except through many right-angle turns, which means hard turning or even stopping – slow points for progress. The extremities of a grid are very separate from their counterparts on opposite sides. There is no efficient method for bulk maintenance in a grid-- all pathways are individually maintained. Expansion in a grid may create oblong rectangles, making the management of the system even more difficult. Additional avenues of flow distort the symmetry of the structure as a whole, similarly distorting its management. Planning public transportation routes is complex and may neglect certain areas or be so slow as to become a burden.

In stark contrast to the squares and rectangles of a grid, circles will forever have a central point from which to control all of the circumambient flow and may be aided by spokes or spirals. That is, to get from an inner circle to an outer one, a road gradually following the curve of the circles to connect the two allows for smooth transitions. Transition roads can be designed so that on-ramps coming from inner circles to outer will merge on the right side of the outer circle, and outer circles to inner circles will always merge with the inner circle on the left side. Many radial layers to the circle may be added as necessary to maintain a city's required space or flow.

Additional avenues do not distort the symmetry as a whole, as they are applied to the entire circle as rings or spirals. There is a gradual turn so that high speeds may be maintained throughout the duration. While the distance traveled across the circumferences may be a greater distance than point to point travel, there are no crossing paths, and all travelers are going in the same direction until each individual location to depart arrives.

Although circular designs are abstract in concept, there are practical applications. One of the most obvious applications of a circular design is to a city itself. Governmental structures could be constructed in the center of the city and radiate as far from the central point in proportion to the expected size of the city for the next 100 years, and all buildings could be designed as the base of skyscrapers. The next layer could be the major infrastructure sites, such as treatment plants, public property storage, and other similar sites. The third ring from the center could be the park and leisure ring. Moving out from the second ring could be the residential ring. From there, the next could be business, and outside that could be agriculture or other miscellaneous spaces required for the operation of life in the city. Of course, planning and advising committees are able to rework zones that promote the smoothest operation for the city. Instead of blocks, the general layout of the zones would be in wedges, always pointing towards the city's center. The rings of roads should be connected with intermediate spiraling spokes to smooth the transition from the furthest ring into the center.

Similarly, there should be spiraling spokes outward to accommodate travel out. There will be less traffic without any hard corners for drivers to stop at. Similarly, the traffic flow will be more predictable, allowing for the integration of newer technology, such as automated driving or electrified roads, to be an easier feat. The redundancy of subsequent rings will also allow traffic to be diverted inward or outward, transposing traffic in the case of an accident or major roadwork. The impact of less traffic throughout a large population will have stacking effects. Immediately, if all states implemented circular designs to reduce traffic, much money could be saved. Victor Miller from Stanford University claimed in 2011 that breaking and speeding back up accounted for 2% of energy consumption in the U.S., which is “about 3.5 million gallons of gasoline per day, or about 1.2 billion gallons per year. If the average American fills up his 15-gallon gas tank once every other week, this is enough gasoline to satisfy the annual needs of 3 million average Americans” (Miller, 2011).

With any change comes counter opinions to push back against sudden shifts. Some people with perspectives against implementing circular designs may claim that circles are not in our culture and, therefore would make neighborhoods and cities look and feel foreign. Further, some in the public may find that implementing a circular design is too expensive. Our city planners would have to figure out where building in the subsequent rings should go or how to transition into and out of the rings, which would cost more money than using the already generally understood linear designs. These comments are logical objections, however, planning an entire city by the design of a circle will have greater long-term benefits for sustainability, cost-effectiveness, and time management for all of the city’s citizens. The lightening of the traffic burden alone will greatly benefit society, besides clearing up the management nightmare of a disordered structure. The Centers for Disease Control and Prevention states, “ every year, about 790,000 Americans, have a heart attack.” (Centers for Disease Control and Prevention, 2017). How much of the burdens on their hearts could be lightened if there was increasingly less stress from traffic, providing time benefits to society to create more feelings of productivity and efficiency?

First, the concept of adding a circle for efficient transportation already exists in today's infrastructure in many ways. First, on the smallest level, there are roundabouts, which remove the necessity of traffic lights and allow traffic to flow through its own intuition. Maryland found that where a roundabout is used, "accidents of all types have been reduced by over 60 percent, and accidents resulting in injuries have been reduced by over 75 percent. Roundabouts also offer high capacity at intersections without requiring the expense of constructing and maintaining a traffic signal." (Maryland State Highway Administration, Traveling Maryland's Roundabouts – FAQ). Clearly, Maryland has confidence that the small-scale circular designs of roundabouts are cheaper than traffic lights and much safer.

Second, urban sprawl will naturally hold a city as the location to move out and take the general shape of a circle. However, circular cities can combat urban sprawl, which is unhealthy for the areas. Urban sprawl can be defined as "the decentralization of human occupancy. That is, communities are requiring more dispersed, and simply more, land and space per person to provide homes, workplaces, shopping locations, and recreation spaces." (Cornell Community and Regional Development Institute, 2019). Rather than going against the grain of our natural tendencies by building linear structures and roads, we should build structures that support our tendency, which allows for a much more impressive flow of society. The Texas A & M Transportation Institute states in three bullet points that by 2020,

"- Annual delay per commuter will grow from 42 hours to 47 hours.

- Total delay nationwide will grow from 6.9 billion hours to 8.3 billion hours.

- The total cost of congestion will jump from $160 billion to $192 billion."

(Texas A & M Transportation Institute, 2015).

On a comparable scale to urban sprawl, we have roads called belt loops, such as 695 around Baltimore, that mimic the circular tendencies of urban sprawl and force us to create the methods for transportation that the situation necessitates, but only on the outside, as a boundary. We still opt for inefficient linear designs on the insides of the circular roads. Rather than reactively building belt loops around our sprawl, proactively creating circular cities will allow for maintainable growth.

There have been many instances throughout history where the circle is the ideological source of equal representation. For instance, the Round Table knights chose the circle to show they were all equal. The United Nations adopted a circle or semicircle for meetings. Similarly, the United States Congress and Maryland state legislatures are organized semicircularly. All chambers use the circle, or its properties, to make the power distribution and representation throughout the chamber equal among its members.

Similarly, the concept of a circular city is not new. In fact, Plato describes Atlantis in Critias as a circular city. If it was not a real city, the concept of circular cities has existed at least since 360 BC, more than 2000 years ago. If the city of Atlantis was real, then the designs are much older. The ancient depiction of a circular city was made by giving a new zone to the next generation of inhabitants instead of creating zones based on city operations, as suggested above. Plato describes some of the ancient city's infrastructure by stating, "The water from the baths was carried to the grove of Poseidon, and by aqueducts over the bridges to the outer circles" (Plato. Critias (p. 6). Kindle Edition). This means the water started from the center circle and went to every region further and further out.

Further, a circular city is much easier to build public transport into. For instance, there could be a series of trains that continuously loop. Rather than paying an operator, the track would be so predictable that the train could be automated to stop and go. Along with this pattern, there could be a continuous train throughout the whole loop, so there would never be a need to look out for crashes, such as in the positive train control regulations. A continuous train would also permit every station to load and unload passengers. No one would be left wondering when the train was coming because it would never be out of sight. The alternating rings could change the flow of the trains so that there is always a way to get back and forth without making a complete loop around the city.

Change is good. Most change is unfamiliar. The most uncomfortable changes may even be the best ones. We need to provide stable sustainable environments and designs for our State to benefit ourselves and uncountable future generations. A major change toward sustainable design is the implementation of circles since they are easier in all respects other than consistently crafting the correct amount of curvature throughout all 360 degrees. Regardless, our future requires us to design with the long-term future in mind.

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