

# Resource-Centered Cities and the Opportunity of Shrinkage

Katleen De Flander

**Abstract** Our planet is being anthroposized at high speed with Climate Change and other global environmental damages as its consequence. As home of most consumers, many are looking at cities for solutions. Urban densification is often seen as ‘the’ way towards more urban sustainability. However, externalities of urban consumption and the complexity of the urban system are mostly left out of consideration, leading to unexpected results. This chapter advocates a transition from consumption-centered to resource-centered cities. In an age of rapid urbanization, this chapter further argues how shrinking cities could unexpectedly function as catalysts for change. A shrinking population and a retreat of the current economic system give shrinking cities the potential for becoming front-running resource-centered cities.

**Keywords** Resource-centered • Complex systems • Transition • Shrinking cities • Closed cycles

## 1 Introduction

Climate Change has emerged as one of the most challenging political and scientific issues of our times. With ever increasing trends in urban consumption and production practices, a call for action to mitigate climate change is often seen as a way to foster sustainable development. Considerable attention is now being paid to determine what urban sustainability would include. Is a ‘sustainable city’ a city that uses 25 or 50 % less energy? A city that is carbon neutral, whether with or without carbon offsetting? A city that doesn’t have cars or that has green roofs and

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solar panels? Many cities/neighborhoods/buildings are called ‘sustainable’ or ‘eco’ because they are doing better than mainstream but is this the right approach?

In response to the question “What is the single most important environmental/population problem facing the world today?” Diamond (2006, p. 498 cited in Frey and Yaneske 2007, p. 61) captures the essence in his answer: “The single most important problem is our misguided focus on identifying the single most important problem!” In other words, the real world is full of interactions and connections. “Complexity science is moving us away from a linear, mechanistic view of the world, to one based on nonlinear dynamics, evolutionary development, and systems thinking” (Sanders 2008, p. 276). Climate Change should therefore be understood as a complex system. Interestingly, cities are as well. Bai et al. (2010, p. 130) indicates that “cities are increasingly recognized as complex adaptive systems<sup>1</sup> that integrate, respond to, and influence a diverse range of social, economic and ecological processes operating across a range of spatial and temporal scales. Connections between urban systems and regional and global change are therefore characterized by significant nonlinearities and cross-scale interactions among slow and fast moving processes”. This understanding avoids us getting on a reductionist track, which deals for instance only with Carbon neutrality. It makes us focus on a broader transition process in cities and recognize not only their nonlinear behavior but also their transformative capacity while staying functional.

## 2 Myth Busters

Although it is widely ignored, we are not going to solve Climate Change and other global environmental problems within our current economic system. The story that more free markets, more consumption and new technology (these are the ones that created our problems in the first place) are going to save us urgently needs some myth busters. Technology can help, but pretending that we can get away with our current lifestyles because ‘green’ technology will solve everything, is being naive at the very least, especially with an eye on the expected population growth.

Conventional economics as currently practiced is largely responsible for the increasing strain on global resources. The economic performance of nations is generally measured as gross domestic product (GDP), a large component of which is generated by consumption. The way to increase economic performance is therefore by increasing consumption, which in turn demands increased production. In conventional economics, the productive capacity that produces the goods and services is considered to be a function of human-made capital

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<sup>1</sup> ‘Complex Adaptive Systems’ (CAS) are a specific category of complex systems—open evolutionary systems such as a rain forest, a business, a society, our immune systems, the World Wide Web, or the rapidly globalizing world economy—where the components are strongly interrelated, self-organizing, and dynamic (Sanders 2008, p. 275).

only, excluding non-renewable and renewable natural capital, which is considered to be a free good that cannot be depleted (Daly 2001 cited in Frey and Yaneske 2007). Further excluded are the costs for repair of damage to the environment as a result of production and consumption.” (Frey and Yaneske 2007, p. 56)

One of these myth busters is Nair (2010) who describes the role of Asia in reshaping capitalism, arguing that it is realistically impossible for Asia to follow the same path as the developed countries due to mere numerical facts. “The world has reached a stage where economic growth, and in particular trying to maintain it via consumption-driven capitalism, has become the driver of our problems” (Nair 2010, p. 76). “We have to put limits on the use of limited resources. So as well as focussing on the quantity of consumption, we need to look at its quality—what consumption is composed of and what changes can be made to it” (Nair 2010, p. 80). This is of course not a popular viewpoint. Many stakeholders have advantages of staying with the old system, but as Einstein pinpointed: ‘You can’t solve a problem with the same mind that created it’. A change in mind-set needs to take place where consumption ceases to be at the centre. Instead of consumption, what is truly at the center of everything are resources. Natural capital has made our conventional economic system possible in the first place. Natural resources have also made it possible to develop cities. A failure to recognize that natural resources can be depleted has already lead to the demise of several cities and empires in the past. ‘History tells that the destruction of the bioproductive capacity of a city’s hinterland through the exhaustion of its fertility and the available water supply has happened quite frequently, leading to the self-imposed collapse of cities’ (Frey and Yaneske 2007, p. 80).

Girardet (1999, p. 17 cited in Frey and Yaneske 2007, p. 85) sees Rome’s fate as the direct result of the massive exploitation of its very large hinterland. (next to other major contributing factors such as lead poisoning and plagues). According to Mumford (1984 cited in Frey and Yaneske 2007, p. 85), due to the overexploitation of Rome’s hinterland and the damage done to the environment as a result of this, the empire’s bioproductive capacity became increasingly smaller and resulted in a shortage of food for Rome’s one and a half million or so inhabitants. Mumford sees the disintegration of Rome as the ultimate result of its over-growth, which resulted in a lapse of function, and a loss of control over the economic factors and human agents that were essential for its continued existence. Prosperity and population were declining and the barbarians began to infiltrate the over-extended empire.

Is the same happening to modern cities? The following example shows the massiveness of the problem we are facing in real time: China will build new housing for 400 million people in the next 12 years. If they use brick as the main construction material, they will use all their soil and burn all their coal and they will have cities with no energy and no food (McDonough 2005).

### 3 From Consumption-Centered to Resource-Centered Cities

As Nair (2010, p. 136) suggests: “The big change will lie in putting values on things humans have long taken for free or nearly free—the environment in which we live and the resources it provides us with [...] Putting resource management at the center of policy making will shape how individuals consume, how companies do business, how food is produced and water is used, how the balance of rural and urban is reworked.” Sassen (2010, p. 3) poses the following crucial question: “Are these global ecological conditions the results of urban agglomeration and density or are they the results of the specific types of urban systems that we have developed to handle transport, waste disposal, building, heating and cooling, food provision, and the industrial processes by which we extract, grow, make, package, distribute, and dispose of the foods, services and materials that we use?” Combining Nair’s suggestion with Sassen’s question leads us to an approach that focuses on a transition of our urban systems based on rethinking their resource management. This stands in sharp contrast with the common approach of technological fixes and efficiency improvements. While ‘improving efficiency’ starts from the status quo of the current system, and ends up with a 20 or 30 % ‘less bad’ system, the Resource-Centered City stands for a transition to a new system. Not ‘new’ in the way of building ‘new eco-cities’, but ‘new’ in the way of re-organizing our urban systems.

The inevitable outcome of the continuing pursuit of economic growth and of increased consumption and production will be an eventual shortage of resources. [...] Attempts to reduce resource wastage in the production and consumption process, a Factor 4 approach (von Weizsäcker et al. 1998 cited in Frey and Yaneske 2007), will reduce resource consumption but will only buy us time, as this reduction will soon be caught up by increasing population and consumption levels” (Frey and Yaneske 2007).

Another consequence of a resource-centered approach is that it forces us to think about the externalities of urban consumption and the relationship of the city with its hinterland. Because we are offsetting the negative consequences of urban consumption outside the city, they are hidden from the eyes and minds of most of the consumers. Externalities of urban consumption are one of the main causes of inequality, be it rural/urban, rich/poor, North/South. A resource-centered city is not a one-resource exploiting or dependent city but is as far as possible self-reliant when it comes to resources. By tackling consumption at its source, the resource-centered city avoids externalities in the most direct way possible. For instance: “By restricting emissions directly at the source, there would be no need for indirect schemes which tend to reward established companies, in both finance and the energy industry, and have already proved readily open for abuse” (Nair 2010, p. 148).

The rural–urban relationship, or as Sassen (2009) suggests urban and non-urban,<sup>2</sup> in our current consumption-centred cities could in many cases be described as parasitic. Since natural capital and resources are seen as a free good, the urban hinterland is emptied out from natural but also human resources (in the form of cheap labour working in the cities) at almost no costs. On the other hand, expensive products from the city return to rural areas for consumption. Attempts to avoid rural–urban migration or export urbanity to rural areas have mostly failed. An interesting thesis Nair (2010) brings up is that weakening the links between wealth and major metropolitan centres (by switching to a resource-centred approach) could lessen the pressure to create mega-cities and could rework the urban–rural balance.

## 4 From Consuming to Producing Cities

At the moment, our cities have a linear approach to using resources. Materials, energy, food and water enter the city from its global hinterlands (leaving its traces there in the form of a.o. soil degradation, water pollution and deforestation), are partly consumed and the rest leaves the city in the form of waste, wastewater and polluted air (also affecting of course inner city air quality). This means that the externalities of urban consumption are carried by a large number of global hinterlands and for a large part hidden from the urban consumers. If we are to understand and respect our limited resource base, cities need to adapt from a linear to a circular resource use and evolve from consuming to producing cities where waste doesn't exist, resource cycles are closed and impacts on the environment (air, water, soil) are neutral or even positive. At the same time, cities need to reduce the geographies of extraction and environmental damage caused through urban consumption (Sassen and Dotan 2011).

Becoming a Resource-Centered city thus means that cities will have to stop their parasitic behavior and provide their own resources. On the one hand, if markets have to work within set limits of resources, cities will be forced to start harvesting<sup>3</sup> their own resource streams such as rain, wastewater, materials and nutrients. This closing of resource cycles is nothing new. In pre-industrial cities it was (and in some parts of the world still is) normal to collect for instance urban

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<sup>2</sup> “Cities have a pronounced effect on traditional rural economies and their long-standing cultural adaptation to biological diversity. Rural populations have become consumers of products produced in the industrial economy, one much less sensitive to biological diversity. The rural condition has evolved into a new system of social relations, one that does not work with biodiversity. These developments all signal that the urban condition is a major factor in any environmental future” (Sassen 2009).

<sup>3</sup> ‘Urban Harvesting’ is a concept that is based on tracking and harvesting all the resources in the city and bringing them back in an endless resource cycle. Also called ‘Urban Mining’, definitions may differ including or excluding certain resources and methodologies.

organic waste (also from animals and humans) and reuse its nutrients for food production. Modern cities have forgotten their potential of being part of a resource cycle instead of damaging it.

Making the transition from consuming to producing cities, they will have to find space within their urban fabric to produce resources locally: space for energy, materials and food production, space for water treatment and infiltration. This will need to go much further than by just putting solar panels or urban gardens on top of the roofs. The whole city will need to be activated and re-organized, starting from changes in consumption and production patterns, to re-organizing the urban systems and changing urban land-use (for instance by taking space from car-infrastructure for creating a decentralized water treatment system in the neighborhood). All parts of society will need to be tackled, not just private consumers but also companies, industry and agriculture.

Consequently, in the resource-centered city, not efficiency improvement but re-organisation is key. The starting point is therefore not a product or specific material (as in Life Cycle approaches) but includes exploring the 'function' or 'provided service' for which work is needed; and leaving space for re-organisation and trend-change in the urban environment. 'Shelter' for instance can be provided by a building, also by a building that was initially not meant for housing (re-organising space). If we go a step further saying that this shelter should provide a certain thermal comfort level to the people needing its service, this can be solved in different ways. The shelter can be insulated (material) and/or heated (energy) and/or people can wear more clothes (material + lifestyle change) and/or maybe we need to look at a seasonal building use. Each of these solutions will have a different resource demand and decisions have to be taken looking at the integrated outcome. In a closed-cycle approach, using the energy principle for both energy and materials, Rovers and Rovers (2011) come to the conclusion that against the regular way of thinking, "it seems more efficient to just heat the non-insulated houses with solar collectors instead of growing materials for its insulation". Oswalt and Schmidt (2010) come to a similar type of conclusion: "It needs to be weighed whether the energy expended in optimising the buildings does not outweigh the energy saved for its operation".

By looking at our urban systems through a network of resources (soil, air, water, materials, energy, nutrients), which by nature are highly interconnected (influencing one resource can have both positive or negative feedback on the others), we are forced to take a complex systems approach and avoid the danger of focusing only on one resource, a problem often arising from the compartmentalization in sectors, departments, professions, etc. After all, a change in our food system will probably have a greater effect on our energy consumption than simply aiming for a more efficient domestic energy use. As a repercussion, inter- and trans-disciplinarity becomes a must to realize any successful transition in a complex system. Also production choices in the city will have to be seen from within the interconnected network of resources and priorities will have to be set. For example: producing energy by placing solar panels on fertile soil is not the smartest solution because you block your fertile soil to be used for food

production. On the other hand, placing solar panels on existing buildings or placing windmills between food production areas creates a double space function.

So far, instead of rethinking the systems we have developed, systems that resulted in climate change, resource crises and other environmental problems, we are still trying to solve the problems they have created within the same system. A good example is our transportation system that is for a large part based on the car and is a vast contributor to oil dependencies, climate change, health problems, air and water pollution, impervious soils, unliveable cities, etc. Instead of rethinking the system and start thinking in functions ('I need to be mobile') and not in goods ('I need a car'), dependencies on cars are now nurtured under the name of green cars, biofuel or electric mobility and car companies are bailed out in the name of 'saving jobs'. Instead, the focus should no longer lie on increasing consumption, leading to more throughput of resources. Companies will have to find new ways of creating value. There will be a shift from selling products to selling services, which will give a new meaning to product quality, durability and re-usability. There will also be a shift from taxing income to taxing consumption.

The shift from consumption-centered to resource-centered cities is at the same time an important key to mitigate climate change since changing the way we deal with resources will tackle many causes of climate change. When we re-organise for instance our urban food system by re-localising food production and changing our food habits, this will immensely reduce greenhouse gas emissions because it will reduce transportation distances, reduce packaging and reduce industrial agriculture (producing lots of CO<sub>2</sub> and N<sub>2</sub>O emissions because of its high energy and commercial fertiliser use). On top of that, land use changes (from forests to industrial animal and food production or because soils have been exhausted by chemicals and fertilisers) can be limited or turned around. Our diets might have to change but we definitely don't have to miss out on variety nor on good nutrition. Another example is the change of our transportation system in and between cities, which is a major contributor to climate change. Tackling the 'car' is a main challenge but who would have believed some years ago that smoking would be prohibited in public spaces? If cities have to become more self-reliant when it comes to resources, the space for car infrastructure in cities will prove to have a lot of potential. A revival of high quality public spaces and public transportation will be crucial to keep the 'mobility' function working and to create new quality of life in our cities by giving again priority to the human scale.

## **5 The Opportunity of Shrinking Cities: 'Less is More'**

I argued that we need a transition from consumption-centered to resource-centered cities. Since producing resources demands space, density plays an important role in balancing out demand and supply in a specific system. In this view, shrinking cities have a clear advantage when it comes to closing resource cycles since

through shrinkage processes in cities, “concentrations” can be eased so as to accommodate the principle of closed cycles in the city.

Less dense living is often associated with waste of space and resources, but what if that space would not be “wasted” but used to produce the necessary urban resources instead of scavenging outside the city boundaries. What if a shrinking urban population is the ideal catalyst for introducing a Resource-Centered approach? Maybe the question becomes: how much shrinkage is necessary for a city to be able to close its resource cycles and become self-reliant? Could we say: ‘The less people, the better?’

Urban planning and transportation theories such as ‘Smart growth’, ‘Compact City’ and ‘Urban Intensification’ all assert that high-density cities are more sustainable than low-density cities. This is mostly affiliated with the higher petrol use of low-density cities (as for instance many car dependent North American cities), and the greater use of public transportation systems and smaller housing units in denser settlements. However, “the relationship between urban population density and the environment in its broader sense is further complicated by the spatial displacement of environmental costs. Although it is often argued that denser urban settlements make more efficient use of land and other resources, at least some of this can be attributed to their ‘ecological footprints’ outside the spatial boundaries of the city” (Wackernagel and Rees 1995; Wackernagel et al. 2006, cited in Dodman 2009, pp. 3–4). Most cities import the majority of their resources such as energy, food and materials from outside their city boundaries and are therefore mostly consuming places. Resource depletion, pollution, energy use (for example embodied energy) and waste outside the city can therefore often be linked to the linear resource approach of cities which input and output starts and ends outside of the city. Therefore, taking into account the spatial displacement of environmental costs of dense areas, the statement that “higher density cities are more sustainable” becomes questionable and is clearly based on the current linear city system thinking.

From a resource-centered perspective, we want to internalize these environmental costs by moving from a linear to a circular system. The urban system will need to provide as much as possible in its own resource needs, instead of scavenging outside. This perspective puts density into a whole new light. We are not talking anymore about per capita energy use or per capita CO<sub>2</sub> emissions but about what density means for the city’s production capacity and about its resource demand and supply possibilities. Less dense cities have a lot more space for resource production and at the same time, they have less demand for resources (mind the ‘rebound effect’<sup>4</sup> which is a perfect example of an unexpected outcome in a complex system). In short, while in the current linear city system thinking, density might be increasing sustainability, from a changed resource-centered

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<sup>4</sup> The ‘rebound effect’ is an unexpected behavioral or systemic response that reduces or even turns around the expected result of for instance an efficiency measure. An example in this context: the beneficial effects of a reduced population leading to less demand for resources could be offset by an increase in personal consumption caused by price decreases of goods resulting from excessive stocks.



system perspective, lower densities bring many more possibilities. Now this is not an advocacy for reducing density everywhere to suburban levels and stimulating urban sprawl. It is however an argument that by changing our system's perspective, the roles can be turned around and 'Less becomes More'. In this perspective, Shrinking Cities show high potential.

## 6 Density in the Light of Shrinkage

When discussing density in the light of shrinkage, the following points are important:

First, I believe it is important to lose the image of a shrinking city being an empty village that doesn't have enough children to fill a class-room. Many large cities are also shrinking; especially old industrial cities (for instance Osaka, Liverpool, Detroit) are losing population in favor of service cities. Besides this, shrinkage can take different forms. Next to an overall thinning out, we more often see a polarization within the city: from the center to the periphery or from one part of the city to another. This polarization results often in even bigger social and racial segregation and inequalities. Shrinking cities are already a common phenomenon worldwide and will be even more so in the future. "Since years one can observe demographic decline in great parts of Europe. Even on a global scale urban shrinkage is a widespread phenomenon. According to different studies every 6th–4th large city worldwide has lost population in the 1990s" (Wiechmann 2006). While many are focusing their attention on growing (mega-) cities, it has become clear in the last years that it makes a lot of sense to set a parallel focus on current shrinking cities since they are a shape of things to come.

Even though urban growth will continue to dominate in the coming decades, the number of shrinking cities is continually increasing. An end is in sight, however: around 2070–2100, the world population will reach its zenith and the process of urbanization will largely come to an end. Then the processes of growth and shrinkage will reach a balance, and urban shrinkage will be a process as common as it was before industrialization began. [...] Shrinkage will in future be considered as normal a process of development as growth. It will lose its stigma and come to be seen as a scenario that has advantages as well as disadvantages and that leads to distinct forms of renewal and change. In the discourses on the city in the USA the shift in terminology away from 'urban decay' and 'urban decline' towards 'shrinking cities' indicates that such a change in thinking is underway" (Oswalt n.d.).

Second, it is important to realize that urban density in relation to sustainability is usually discussed in the light of continuous growth. This seems logic when looking at the booming mega-cities. However, when discussing this in the light of shrinking, it becomes a whole different issue. We don't have to debate any more if the growing population will be housed by densifying the existing urban fabric, by using inner city brown fields or by developing new peripheral green fields. We are not even in a position to discuss ideal densities for a compact, walkable city and argue against the unsustainable suburban sprawling (although sprawling is one of

the main causes of urban shrinkage). Realistically, turning Shrinking Cities into a compact city is often a utopia.

Third, urban density in shrinking cities is mostly seen as a problem: costs of basic services and infrastructure are carried by less people and become too expensive or are simply abolished, public funding is reduced, cultural and social activities are abandoned, etc. All this leads to even more people leaving the city. Because many shrinking cities are falling more and more out of the current economic system, they have been ‘spit out’ or have become ‘disposable’ as some local activists call themselves, they often have no other choice than to rely on themselves. We see examples of local food production, places where local currencies have been introduced as a lifeboat to revitalize a local economy, local bio energy production by farmers, space pioneers with new initiatives, etc. These are all attempts to become more self-reliant and at the same time more resilient to outside factors (such as cutting public funds). Although attempts for re-localization are already found in Shrinking Cities, for some reason, making the complete transition has not happened. Why not? One answer could be the ‘Frog effect’. When you put a frog in boiling water, it jumps immediately out of the water because of the shock. If you put him in cold water and bring it slowly to boil, the frog stays and dies. An example of a shock that resulted in action is Cuba. After the country was cut off from 80 % of its food imports and 50 % of its oil imports when the Soviet Union collapsed in the 1990s, Cuba transitioned from an industrial to an organic fossil-fuel independent agriculture in the course of a few years. We could say that shrinking cities are also in a state of shock but since it has been often a gradual process, it didn’t result in action but in a slow death.

Considering the above points, from a resource-centered perspective, density gets a new meaning in the light of shrinkage. With the aim to bring about a resource-based transition, it is more promising to work towards a new system in a place where the old system is already retreating than to change a system that is fully running. Instead of reducing funds, abolishing services and activities in Shrinking Cities, we can switch to a more productive approach to shrinkage. Seeing shrinkage as a catalyst for change, Shrinking Cities can become front-runners in the transition process towards a post fossil-fuel and a resource-centred society. They can become urban labs of how to downscale and re-localize our agriculture, how to dignify food production, how to become fossil fuel independent and decentralize resource production, how to increase quality of life and use the available space for resource production. Not with the aim to create ‘closed cities’ but as catalyst points for a transition that can spread out regionally and beyond.

## **7 Climate Change Mitigation**

It might not be obvious at first sight, but as stated and illustrated before, there is a direct relation between a switch to a resource-centered approach for cities and mitigating Climate Change. As a matter of fact, the relationship is a lot more direct

then with some systems that were specifically invented to mitigate Climate Change. For instance, the Carbon-Credits trading system often avoids direct solutions at source by offsetting actions (but also externalities) to other parts of the world while stimulating business-as-usual at source. By tackling urban consumption and its externalities directly, by re-localizing production and urban harvesting and, more generally, by placing resources at the center of urban policy and management, we are tackling several priority areas for mitigating Climate Change, including greenhouse gas emissions, land use change and deforestation.

Shrinkage has the potential to accelerate the process of becoming a resource-centered city. Front running cities have proven their exemplary function by rippling their success to other cities. Think for instance of the innovative public transportation system ‘Bus Rapid Transit (BRT) System’ that was first introduced in Curitiba and has since then been taken up in several cities globally. This low-cost (to use but also to construct if you compare with expensive subway lines), separate-lanes and high-frequency bus system has effected a modal shift from automobile to bus travel in Curitiba. It also eliminated a great part of the local informal transport mafias and motivated citizens to take a new view on mobility. It was so successful that many other cities around the world have adopted the BRT system. A city that is able to lead change in its urban systems and in the use of it’s resources can ripple its success to other cities. In this view, shrinking cities could play an unexpected exemplary role in mitigating Climate Change in cities.

## 8 Conclusions

In the light of mitigating Climate Change and urban sustainability, this chapter discussed why it is important to start thinking from a resources perspective and why shrinking cities have a high potential following this viewpoint.

A shift from our current consumption-centered cities to resource-centered cities by putting resource management at the center of policy making will shape how individuals consume, how companies do business, how food is produced and water is used, how urban space is activated and how our urban systems are reworked. This will have a major effect on mitigating Climate Change.

Whereas in the ‘Smart Growth’ debate densification is seen as ‘the’ way to sustainability (with the main argument that dense cities are more efficient and use less energy per person, however completely ignoring the externalities of urban consumption), a resource-centered approach allows us to look at density in a different way. If we can see the opportunities of shrinking and couple this with the big environmental challenge we are facing in the 21st century, the current shrinking cities can be the front-runners of a system change. Whole new questions emerge such as: ‘How much shrinking do we need for the city to be able to close its resource cycles?’

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