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## WHITHER ASEAN SMART CITIES NETWORK? EVIDENCE FROM SINGAPORE AND ITS ENERGY POLICY

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**Abstract:** The article analyses the ASEAN Smart Cities Network (ASCN) as part of ASEAN's integration agenda in the context of Singapore's experience, with a focus on its energy policy. On tracing the origins and evolution of the ASCN, its drivers and limitations, the paper turns to analyzing Singapore's priorities and policy in developing smart city programs, strategic and tactical aspects of its energy dimension. The energy component of Singapore's smart city development policy is a representative example of effective management to follow by other ASEAN member states. The paper concludes by several arguments. Although the ASCN is ASEAN's laudable attempt to intensify regional integration, serious non-ASCN and ASCN-specific obstacles hinder its progress. Singapore finds it relatively easy to develop its smart city initiatives, as innovations and cutting-edge solutions have been a backbone of its policy for a long time. The development of the energy sector is an integral part of Singapore's economic growth and directly affects its social and economic modernization paradigm. Although selected aspects of this topic have been explored in academic literature, their synergy, substantiated by area research (the energy sector), has not been in the scholarly focus to date. More than that, lack of an instrumental component, exemplified by a subject-oriented approach, makes any research just a paper exercise. Responding to this methodological gap, a subject-related approach (the energy sector) synergized with regional (the ASCN) and intra-country (Singapore) trends accounts for the novelty, originality and relevance of the study.

**Keywords:** *ASEAN Smart Cities Network, integration, intra-ASEAN imbalances, Singapore, digital transformation, Smart Nation Vision, energy sector, efficient energy supply, renewable energy sources*

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Научная статья. Исторические науки

## ЭВОЛЮЦИЯ СЕТИ УМНЫХ ГОРОДОВ АСЕАН НА ПРИМЕРЕ ПОЛИТИКИ СИНГАПУРА И ЕЕ ЭНЕРГЕТИЧЕСКОЙ СОСТАВЛЯЮЩЕЙ

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**Аннотация:** В статье проведен анализ Сети умных городов (СУГ) АСЕАН как одного из компонентов интеграционной повестки Ассоциации в контексте опыта Сингапура с акцентом на его энергетическую составляющую. Прослежены истоки и эволюция СУГ АСЕАН, ее движущие силы и препятствия на пути реализации. Определены приоритеты и политика Сингапура в развитии программ «умного города», стратегические и тактические аспекты ее энергетического измерения. Энергетическая составляющая сингапурской политики развития умных городов является показательным примером эффективного управления для других стран-членов АСЕАН. Выводы исследования состоят в следующем. Хотя СУГ АСЕАН является похвальной попыткой Ассоциации придать импульс процессам региональной интеграции, прогресс этой инициативы затруднен серьезными препятствиями, как имеющими, так и не имеющими отношение непосредственно к ней. Сингапuru относительно просто развивать программы «умного города», поскольку инновации и технологически продвинутые решения уже долгое время остаются основой его политики. Развитие энергетического сектора является неотъемлемой частью экономического роста Сингапура и напрямую влияет на социальные и экономические особенности его модернизации. Хотя отдельные аспекты этой темы нашли отражение в научной литературе, их увязки, подкрепленной предметными исследованиями (в данном случае предметным направлением выступает энергетика) до сих пор не проводилось. Более того, недостаток инструментальной составляющей, примером которой служит предметно-ориентированный подход, обуславливает невысокую практическую значимость любого исследования. Новизной, оригинальностью и практической значимостью данного научного труда, как ответ на указанную выше методологическую проблему, служит предметно-ориентированный подход (энергетический сектор) в увязке с исследованием региональной инициативы (СУГ АСЕАН) и особенностей внутренней политики страны (Сингапур).

**Ключевые слова:** Сеть умных городов АСЕАН, интеграция, дисбалансы внутри АСЕАН, Сингапур, цифровая трансформация, Видение умной нации, энергетический сектор, эффективное энергообеспечение, возобновляемые источники энергии

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Smart cities are a hot topic in the present-day expert and political discourse for many reasons. Amidst the rising urbanization, the focus on economic efficiency in the priorities of many countries is complemented by a rising need to address and eventually resolve socially oriented tasks. Although this approach is not without shortcomings, especially when it comes to applying technological solutions to cities with a long history, nevertheless, ample evidence suggests that smart city development has become a long-term and sustainable trend. Smart city-related initiatives penetrate many sectors and include an access to government services, predicting and monitoring natural disasters, adopting smart transportation solutions, to mention just a few examples. Smart city-related initiatives differ in the way they are implemented. Top-down cities (the authorities plan and control relevant processes) are complemented by down-top cities (planning and control are given to individuals and local communities). Selected examples combine these two characteristics.

Southeast Asia is an illustrative case of how cities originate and evolve, as well as of multilateral efforts to develop them. In light of this, to trace the ASEAN Smart Cities Network (ASCN), as well as Singapore as a “living lab” for smart city development, including its energy dimension, is a timely and relevant exercise. Within the ASCN framework, there is no clear trajectory for the development of the energy sector in relation to smart cities, apart from selected local projects. Singapore is an outstanding example of a smart city in the process of transformation, including the energy sector amidst rising energy demand.

### **ASEAN Smart Cities Network as a Multilateral Initiative**

Among major drivers that influence on the launch of the ASCN, the following are noteworthy. Across Southeast Asia, urbanization is rising steadily. Realizing that the trend is inevitable, ASEAN member states try to cope with it. The more so since in Southeast Asia, there are numerous urbanization-related problems ranging from traffic congestion to garbage dumps while by their design, smart cities produce a high level of public safety, convenience, connectivity, efficiency and resilience. Urbanization-related challenges are increasingly embracing second-tier cities: Da Nang, Mandalay, Davao City etc. The ongoing digital transformation, including the digitalization of business practices, government-business relations etc., logically incentivizes city authorities to adopt digital instruments of urban development, as well as carefully study examples of excellence from other regions.

The afore-presented factors incentivized ASEAN to launch the ASCN project in 2018. To contextualize the issue, the idea of smart cities resonates with the ASEAN Economic Community and the Master Plan on ASEAN Connectivity 2025. As specified by the ASEAN Smart City Planning Guidebook, the Master Plan on ASEAN Connectivity “sets out ASEAN’s vision to achieve a seamlessly and comprehensively connected and integrated ASEAN”, as well as “identifies “Sustainable Infrastructure” as a strategic area”. In light of this, the ASCN can be a good instrument to enable the association to achieve its strategic goals<sup>1</sup>. In these circumstances, after initial preparations that included a Smart Cities Governance Workshop and the first ASCN formal meeting, the association adopted the ASCN framework<sup>2</sup>. The project aims to promote cooperation across six priority areas: civic and social, health and well-being, security, quality environment, build infrastructure, industry and innovation<sup>3</sup>.

The ASCN project has noteworthy features. It recognizes differences between diverse types of cities (administrative, commercial and tourist). It distinguishes between “smart city sandboxes” (Singapore), prime movers (seven big cities whose organizational shortcomings can be eliminated by smart city-related instruments), emerging champions (six mid-sized cities with financially insufficient capabilities to develop smart city-related programs) and agile seedbeds (twelve cities that may use selected smart city-related applications)<sup>4</sup>. The initiative promotes cooperation between the 26 chosen Southeast Asian cities and their extra-regional partners from both the government and the corporate sector<sup>5</sup>.

The ASCN focuses on upgrading its instruments. In 2023, the ASEAN Smart City Investment Toolkit was launched. As its name suggests, the initiative aims to select smart city-related projects for investments across the ASCN pool. The ASEAN Smart City Professional Program aims to increase relevant competences by means of immersive training. In August 2023 (the latest data available), the ASCN developed 86 projects. Among them, civic and social accounted for 30%, built infrastructure for 23%, quality environment for 21%, safety and security for 12%, industry and innovation for 8%, health and well-being for 6%<sup>6</sup>.

Arguably, the ASCN major challenges fall into two categories. The first one addresses non-ASCN narrow points. Legal aspects of smart city development matter, as economic and commercial activity in the digital field is not clearly specified. Furthermore, informing people of emergencies and natural disasters, as part of the smart city agenda, can be a double-edged sword: if people are informed on even the smallest hurricane, they will start ignoring these messages sooner than later. Lastly, the ethical di-

mension is important, as some people may consider their personal information, no matter of what kind, to be too sensitive to be disclosed.

The second category of challenges applies specifically on the ASCN. In fact, the 26 cities included in the ASCN pool differ significantly across multiple criteria<sup>7</sup>. In addition, intra-ASEAN digital gaps play an important role, as smart cities are a function of broad digitalization-related trends. According to the ASEAN Digital Integration Index, Singapore, Malaysia, and Brunei are above the ASEAN average level of indicators (they include digital trade and logistics, data protection and cybersecurity, digital payments and identities, digital skills and talent, innovation and entrepreneurship, and institutional and infrastructural readiness), while Cambodia, Myanmar and Laos conspicuously underperform. Even more importantly, according to the same criteria, ASEAN is behind its RCEP partners, a factor that seriously undermines its RCEP driving force positions<sup>8</sup>.

The ASCN origins, evolution and interim results demonstrate that the association expresses strong interest in developing this area of cooperation as part of its prospective plans. The progress, however, is unlikely to be fast and free from setbacks, as many obstacles are in place. This makes it all particularly important to trace the experience of selected ASEAN member states, among which Singapore, simultaneously a city and a sovereign state, is a relevant example.

### **Singapore as a Smart City Lab**

Starting with a contextual perspective, several points are noteworthy. Due to its limited territory and lack of natural resources, Singapore crucially depends upon innovations. The country has to match socially oriented programs, environmental sustainability and attractive doing business conditions. As Singapore is a city-state, it has to locate within the city infrastructure objects – the airport, waste processing facilities etc. – that are usually located outside the city. This must be seen in the context of the Singaporean aging population, as the median age in Singapore is 42.8 years<sup>9</sup>. These factors combined incentivize Singapore's authorities to pay close attention to innovations in city planning and management.

An important supplementary factor Singapore's focus on innovations relates to its considerable first-hand experience in developing the national ICT sector and digitalizing the government-business dialogue. Notably, Singapore's first e-government initiatives were launched in the 1980s, as part of the Civil Service Computerization Programme. A remarkable project – One Network for Everyone – started in 1997, followed by E-Government Action Plan in 2000. Subsequent initiatives include, but are

not limited to, iGAP (2006), E-Government Master Plan (2011), e-Gov 2015 and others. To Singapore's advantage, these initiatives have been substantiated with valuable resources, including clearly outlined goals (they are referred to as CARE – courtesy, accessibility, responsiveness and effectiveness), a holistic inter-organizational approach and support from Singapore's business community. Taken together, these factors contribute to the “business-as-usual” perception of smart city development among Singaporeans.

In the Singaporean context, the smart city narrative is part of the Smart Nation Vision. It is pointless to separate them, as Singapore is a city-state. The Smart Nation Vision was launched in 2014 and includes several goals. One of them is to build a robust public sector with cutting-edge innovative solutions. Another one focuses on developing strong economy capable of attracting foreign investment and increase the competitiveness of Singaporean enterprises. Finally, the Smart Nation Vision focuses upon increasing inclusiveness and connectivity between people and communities. From a practical perspective, Singapore's authorities promote people-centric communications based on ICT solutions to facilitate people-to-people dialogue, focus on socially oriented policy, including support for Singaporean elderly citizens, urban planning and environment protection.

Examples are numerous. In July 2018, the company Grab and the National University of Singapore established a partnership to analyze urban mobility data in order to increase the efficiency of transport services<sup>10</sup>. Singapore's Ministry of Health and the Urban Redevelopment Authority jointly established and are upgrading ePlanner, an instrument that can visualize the location and other data relevant to Singaporean elderly citizens<sup>11</sup>. Not surprisingly, Singapore's authorities were able to efficiently operationalize city services during the COVID-19 pandemic, which was a function of Singaporean efficient digitalization-oriented policy.

In this context, the following point deserves attention. Singapore does not aim to create an Integrated Operation and Command Center. This step is considered too risky owing to high value and sensitivity of data. Instead, the Singaporean authorities prefer to gather and process information from different government agencies separately.

The Singaporean authorities learn from world best practices in the field of digital transformation of urban services. For instance, the experience of Helsinki in organizing waste management at homes is a case at point. Home refrigerators are equipped with devices that monitor food expiration dates and signal when the date is approaching. Another example goes to Zurich's multi-functional smart streetlights that collect environmen-

tal data, monitor traffic flows, provide public Wi-Fi etc. Finally, New York City develops Automated Meter Reading (AMR) system to monitor and eventually manage water consumption<sup>12</sup>. Those cases are of considerable importance to Singapore.

Notably, the Singaporean authorities do not prioritize monetary gains over public benefits. On the contrary, a major objective is to improve the quality of service and, by extension, increase public satisfaction. Since approximately 80% of its population lives in the public housing sector, Singapore can experiment with its smart home solutions like water meters, indoor and outdoor automation, perimeter and security lighting etc. Finally, the Smart Nation initiatives are funded by the Singaporean government, while the private sector remains relatively passive. It is not clear whether this approach will bring about good results in a mid-term and long-term perspective.

To sum up, Singapore has been a success in carrying out its smart city programs as part of its Smart Nation Vision. Arguably, for Singapore with its technological, intellectual and, most importantly, disciplinary background, it is a trivial task rather than a serious developmental challenge.

### **The Energy Dimension of Singapore's Smart City Policy**

Integration of smart technologies into city management processes requires efficient and stable operations of supporting directions, including the energy sector. In their turn, smart technologies need much more energy than non-digitalized urban facilities. For both technological and organizational dimensions, sustainability is a crucial factor.

With regard to projects that are part of smart cities and respond to priorities of sustainable development, the energy system matters a lot. Immediate priorities include reducing carbon emissions of greenhouse gases, abandoning fossil fuels etc. The latter point is of special significance. Since the economy is hungry for energy, renewable energy sources are the only alternative for fossil fuel in the green economy concept.

Stable energy supply is a crucial aspect of internet-related technologies and services. They include the Internet-of-Things (IoT), transport services and public utilities that are controlled online. Energy consumption is high even without smart city programmes, while the latter increase energy consumption exponentially. For example, the smart city status abandonment of gasoline and diesel cars that must be replaced with energy-consuming electric vehicles. At this point, the question how to organize the

energy industry in the new conditions to fulfill all demand effectively raises to prominence. On the one hand, there is demand for “clean and green” energy from renewable energy sources, as they respond to the sustainability agenda. On the other hand, as mentioned above, there is rising need for stable supply of electricity at reasonable prices, which renewable energy systems cannot guarantee. Considering those mutually conflicting aspects, several solutions relevant to the “green” agenda in the Singaporean context can be outlined.

First, as the problems of balancing electricity consumption and generation and an increase in their effectiveness are on the agenda, integration of intellectual systems of management electricity consumption comes to the fore. The IoT technologies offer possibilities to control electricity use and distribution and forecast future electricity demand based on big data analysis. Relevant technologies and methods of their implementation are actively studied<sup>13</sup>. Among them: how to integrate various devices, home systems, data-computing infrastructure etc. to increase efficiency of energy usage in the smart building<sup>14</sup>. The features of these technologies and ways they are integrated into smart buildings suggest that they are available to the public without government support. The key aspect of Singapore's energy sector is the transition to renewable energy, which will entail an increase in cost and will encourage the population to use energy-efficient technologies. As an aggregate effect, it will reduce energy consumption, including by means of digital monitoring instruments and smart management of home systems.

Second, the government-business dialogue offers cost-effective solutions to the energy sector. In the Singaporean context, the following example is relevant. In 2021, Grid Digital Twin was introduced. As suggested by its name, it is a “virtual replica of the physical grid network and infrastructural assets”<sup>15</sup>. The focus on predicting, optimizing, and reducing necessary investments is the key feature of this concept. The project demonstrates high motivation of the Singaporean government to use the advantages of digital technologies and efficiency improvement instruments based on public-private-expert cooperation. The latter point is especially noteworthy, as the results of Singapore's smart city-related projects are encouraging and rewarding.

Third, Singapore is planning a large-scale implementation of digital technologies in the city systems, which will entail a significant increase in energy consumption. It will take place in parallel with an increase in the number of data centers and Internet users, an increase in the number of electric transport vehicles, as well as in the overall electricity consumption. Logically, a stable power supply system is necessary. In these circumstanc-



es, energy storage systems (ESS) are of paramount significance, as they meet peak demands. Singapore has already built ESS that is able to power 200 households a day<sup>16</sup>. In a smart city, ESS may be integrated into digital services of electricity consumption monitoring. In its turn, it contributes to enhancing quality of digital twins in the electricity grid. Apart from it, ESS may be used during natural disasters, when renewable energy sources cannot generate electricity.

Summing up Singapore's experience in developing its smart city energy sector, it can be concluded that digital technologies will inevitably become the foundations of the new, smart energy system even if it is based on traditional fossil fuels. Some digital decisions may be used in the energy sector to increase effectiveness of operations, as well as and provide new experience and availabilities to citizens. Singapore uses all modern energy solutions to develop and efficient smart city-related energy sector. Notably, applying IoT solutions to energy consumption control, available to ordinary citizens, and an integration of digital twins are valuable instruments to tackle energy supply crises.

Singapore's experience may be extended to other ASEAN countries in the ASCN framework. The key feature of Singapore is that it is a comparatively small city with tight government control over public services. There are a lot of programs and solutions that ASEAN member states can adopt. From an energy perspective, however, a major task is to organize stable energy supply for their citizens and businesses. As part of the ASCN, ASEAN countries do not have many energy-related projects, except Myanmar and Thailand, with microgrid development and construction on-grid solar systems<sup>17</sup>. Although ASEAN countries carry out individual projects apart from the ASCN, the effect is much less significant. Therefore, Singapore's experience will be useful along the following directions: specialized projects, public and government control, cooperation with the private sector.

In this context, the ASCN may be used as a platform for sharing experience, developing new joint programmes and modernizing of the ongoing projects taking into account the results obtained by all ASEAN member states.

### Conclusion

The analysis of the ASEAN Smart Cities Network through the prism of Singapore's smart city-related policy, including its energy dimension, leads to several broad assessments.

First, the ASCN will almost certainly encounter increasing interests from both ASEAN member states and ASEAN external partners that participate in this initiative. At the same time, however, its practical implementation will inevitably proceed slowly and unevenly. Arguably, a gap between ASEAN's vision and the instruments to translate it into reality possessed by the ASCN participants will remain significant.

Second, Singapore will remain the leader in the ASCN implementation. The reasons are numerous and include Singapore's sophisticated pre-digital assets, its reputation as an attractive doing business hub, lack of agricultural periphery etc. Notably, however, these individual advantages may easily turn into collective obstacles, as the ASCN-related priorities focus on narrowing the existing gap rather than making it wider. As a result, Singapore may be forced to maintain a "low profile" policy when it comes to achieving the ASCN goals.

Concerning the energy dimension of the problem, Singapore is one of ASEAN leaders in implementing digital technologies in the energy sector, simultaneously setting a high standard for other countries, and providing ASEAN nations with first-hand experience in digitizing the energy sector. This experience can serve as a stimulus to strengthen intra-ASEAN institutional ties, as well as foster collaboration in the research field. However, to gain this experience and share it with others, Singapore will have to make additional steps specifically aimed at translating its major components to other ASEAN member states.

In sum, the ASCN will remain a resourceful initiative that will contribute to ASEAN's prospective planning, although contradictions between ASEAN's and Singapore's priorities will probably remain in place.

#### ИНФОРМАЦИЯ ОБ АВТОРАХ

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