

PALACKÝ UNIVERSITY OLOMOUC
UNIVERSITY OF CLERMONT
AUVERGNE UNIVERSITY OF PAVIA

MASTER THESIS

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GLODEP 2020

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**SUSTAINABLE CITY INDICATOR: A CASE STUDY
OF BISHKEK**

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Declaration

I, Yunia Nursita Sari, declare in lieu of oath, that I wrote this thesis myself. All information derived from the work of others has been acknowledged in the text and the list of references is given.

Bishkek, 07/06/2020

A handwritten signature in black ink, appearing to read 'Yunia', with a stylized flourish extending from the bottom right.

Acknowledgement

I would like to sincerely express my biggest gratitude to professor Simona Safarikova, my thesis supervisor, for her valuable input which really helped me to finish this study.

I would also like to thank professor Kiyalbek Akmoldoev, my thesis co-supervisor as well as internship supervisor, for all of his guidance to shape my study and for all of his help during my internship in Silk Road Research Center at the Ala-Too International University.

Last but not least, I want to thank my husband for being there for me and helping me during this difficult time. Without him, all of this would not be possible.

Thank you.

UNIVERZITA PALACKÉHO V OLMOUCI

Přírodovědecká fakulta

Akademický rok: 2019/2020

ZADÁNÍ DIPLOMOVÉ PRÁCE

(projektu, uměleckého díla, uměleckého výkonu)

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Osobní číslo: R170193
Studijní program: N1301 Geography
Studijní obor: International Development Studies
Téma práce: Sustainable Cities Assessment in ASEAN and Central Asia: A Case Study of Jakarta and Bishkek
Zadávající katedra: Katedra rozvojových a environmentálních studií

Zásady pro vypracování

Background

City is an important element in sustainable development due to the global trend of urbanization. Majority of people will live in urban areas in the future, bringing major economic activities with them. This makes urban sustainability become a relevant topic and sustainable cities has been determined as one of the goals in SDGs (United Nation Development Program, 2015). Sustainable cities can be defined as cities that are resilient and able to adapt to economic, social, and environmental change (World Bank, 2019). However, existing indicators for sustainable cities were mostly designed for developed countries while the concept of sustainability is highly contextual. There might be inaccuracy if the same indicators are used for developing world, especially Asia. Asia is considered as the fastest growing region in the world, contributing to more than two-thirds of global growth (International Monetary Fund, 2019).

Among Asian Regions, ASEAN is forecasted as the next emerging industry and „The Tiger Cub Economies“, tailing the success of „The Asian Tigers“. There are many population-dense cities in ASEAN and in the future, those cities will play major roles in the world’s development. In 2025, there will be 3 megacities in this region and one of them is Jakarta. Jakarta was chosen by The Asian Development Bank (ADB) to implement green city development in collaboration with the provincial government (Asian Development Bank, 2019). Being the most populated urban areas with one of the fastest growth rate in ASEAN (United Nations, 2018), this megapolitan city is also known for its severe air pollution and enviromental issues. Therefore, this city is a strategic area to study further.

Unlike ASEAN, as a region consisted of landlocked countries with extreme climate, Central Asia faces a different challenge in applying the sustainable principle in their city development. Moreover, Central Asia is currently supported by The World Bank to apply Sustainable Cities Initiative (SCI), encouraging the government in pursuing an agenda that enhances the sustainability (World Bank, 2019). Among the largest cities in Central Asia, Bishkek is an interesting area to study. This city has a relatively large green areas but it is also speckled by numerous factories as it is located in the industrial zone during the Soviet era, resulting in serious environmental problems (Cartledge, 2014). Furthermore, Bishkek had joined The European Bank of Reconstruction and Development (EBRD) Green Cities Program in 2019, making it one of the only two cities in Central Asia which agreed to apply Green Cities Action Plan (GCAP) with the goals of overcoming environmental challenge and improving the living quality of their citizens.

Aims of the Thesis

In general, the governments of ASEAN and Central Asia have been trying to direct their development toward a more sustainable path, but the lack of adequate instruments to properly measure the sustainability makes it hard to know whether their efforts are effective. Thus, this thesis aims to assess the degree of sustainability of ASEAN and Central Asian cities with a case study of Bishkek and Jakarta, based on indicators suitable for Asia; then further identify the potentials and problems of each city; and finally to give policy recommendations to fill up the gap between the ideal theory and reality.

Data and Methodology

In order to asses the sustainability of ASEAN and Central Asian cities, this thesis will use mixed method approach to analyse publicly available datas, such as existing indicators and guidelines related to sustainable cities from international organizations (UNDP, EBRD, ADB, World Bank, etc) as well as real-life datas covering the economics, social, and enviromental aspect of Jakarta and Bishkek.

Rozsah pracovní zprávy:
Rozsah grafických prací:
Forma zpracování diplomové práce: **tištěná**
Jazyk zpracování: **Angličtina**

Seznam doporučené literatury:

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Datum zadání diplomové práce: **13. ledna 2020**
Termín odevzdání diplomové práce: **22. května 2020**

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Abstract

After the revolution in 2010, the government of Kyrgyzstan had been trying to apply sustainable development by creating a National Sustainable Development Strategy of Kyrgyz Republic (NSDS). Unfortunately, this policy is only available on a national scale and it is not yet known whether the policy covers the significant aspects of sustainable cities. Furthermore, the lack of sustainable city indicators for developing countries makes it even more difficult for the government to assess whether their development has been successful. On the other hand, the problem of Kyrgyzstan's capital, Bishkek, is becoming more complex with the increasing flow of internal immigration (Atambayev, 2014) and severe environmental pollution (Cartledge, 2014). Therefore, this study aims to identify the sustainable city indicators which are specifically tailored for Kyrgyzstan.

This study uses content and PESTEL analysis methods to review Kyrgyz NSDS 2013-2017 and compare it with global level indicators of sustainable cities, such as indicators from UNDP SDG11, Arcadis Sustainable Cities Index (SCI), and EBRD Green Cities Action Plan (GCAP) as well as analyse Bishkek based on PESTEL (Political, Economy, Social, Technology, Environment, and Legal).

The results of the study show that the Kyrgyz national strategy only covers some of the relevant issues related to sustainable city. The policy also needs to be detailed in order for it to be applied on a city level.

Key Words: *Sustainable City, Indicators, Central Asia, Kyrgyzstan*

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Abbreviations

COVID-19	Corona Virus Disease 2019
EBRD	European Bank for Reconstruction and Development
GCAP	Green Cities Action Plan
IADB	Inter-American Development Bank
NSDS	National Sustainable Development Strategy
PESTEL	Politic, Economic, Social, Technology, Environment, Legal
SCI	Sustainable Cities Index
SDG	Sustainable Development Goals
SWOT	Strength, Weakness, Opportunity, Threat
UNDP	United Nations Development Programme
USSR	Union of Soviet Socialist Republics

CHAPTER I INTRODUCTION

1.1 Background of the Study

The global trend of urbanization and growing issue of sustainability have brought us to the new term of sustainable city. In a broad perspective, sustainable cities can be defined as cities that are not only resilient, but also be able to adapt to, mitigate, and promote economic, social, and environmental change (World Bank, 2019). It is one of the goals the global world was 2015, trying to pursue which has been written in the Sustainable Development Goals 11: establishing inclusive, safe, resilient and sustainable city (UNDP, 2016).

However, existing indicators for sustainable cities were mostly designed for developed countries, while in reality, the concept of sustainability is very contextual. There might be inaccuracy if the same indicators are used to assess cities in developing countries. There is still lack of indicators for sustainable cities and communities especially for Asia, while actually, Asia is considered as the fastest growing region in the world with a lot of dynamics, contributing more than two-thirds to global growth (International Monetary Fund, 2019). This will bring more challenge to achieve the sustainable development goals. The Asian region that is rarely being discussed in terms of urban sustainability is Central Asia. As a region consisted of landlocked post-Soviet countries with extreme climate, Central Asia faces a different challenge in applying sustainable principles in the development of their cities. Moreover, Central Asia is currently supported by The World Bank to apply The Sustainable Cities Initiative (SCI) encouraging governmental programs in pursuing an agenda that enhances the sustainability (World Bank, 2013).

This study specifically examines sustainable cities in Bishkek, the capital city of the Republic of Kyrgyzstan. Among the largest cities in Central Asia, Bishkek is one of the cities which goes through some serious environmental problems. Though this city has relatively large green areas, it is also speckled by numerous big factories due to its location in the industrial zone during the Soviet era (Cartledge, 2014). Furthermore, Bishkek had joined The European Bank for Reconstruction and Development (EBRD) Green Cities development program recently in 2019, making it one of the only two cities in Central Asia (the other is Dushanbe) which agreed to apply Green Cities Action Plan (GCAP) with the goals of overcoming environmental challenge and improving the living quality of their citizens.

1.2 Statement of the Problem

There are no appropriate sustainable city indicators for Central Asia, especially for Kyrgyzstan, while Kyrgyz government already sought to reform their policy by leading it to a more sustainable path (NSDS, 2013).

1.3 Objectives of the Study

In general, the government of Kyrgyzstan has been attempting to apply sustainable development especially in their urban areas. While the government has been trying to direct their development toward a more sustainable path, the lack of adequate instruments to properly measure the sustainability makes it difficult to know whether their efforts are effective. Therefore, it makes this subject an essential area to study. The objectives of this research are explained in detail as follows:

- To analyse the main aspects of existing indicators for Sustainable cities at global level, such as the indicators from UNDP SDG11, Arcadis Sustainable Cities Index (SCI), and EBRD Green Cities Action Plan (GCAP).
- To analyse the existing policy related to sustainable development of Kyrgyz Republic, which is presented in National Sustainable Development Strategy of Kyrgyz Republic 2013-2017
- To explain the urban sustainability conditions of Bishkek according to the main aspect of sustainable development
- To identify a new set of indicators for sustainable city for Central Asia using the case study of Bishkek.
- To provide policy recommendations for the government of Kyrgyzstan, especially Bishkek.

1.4 Rationale of the Study

The National Sustainable Development Strategy (NSDS) of Kyrgyz Republic cannot directly guarantee sustainability at the national level, let alone the implementation on an urban scale. Therefore, the government needs to ensure that their strategy is in line to the principle of sustainable city. This study focuses on reviewing the NSDS by comparing it with the existing sustainable city indicators, then offers key indicators that can be applied to Bishkek. Overall, this study is useful for local authorities, governments, policy makers and international organizations to understand main areas which need to be prioritized to ensure the sustainability aspect.

1.5 Scope of the Study

This thesis is focused on the formulation for sustainable cities indicators in Bishkek, Kyrgyzstan, after the dissolution of the Union of Soviet Socialist Republics (USSR) era.

1.6 Data and Metodology

Initially, this thesis would use secondary datas as well as primary data from interviews. However, this thesis was written in Bishkek, Kyrgyzstan and in the middle of global pandemic COVID19 where the government restricts movement and direct social contact, the imposition of a curfew, the closure of public open spaces, and public transportation services. This made the collection of primary data impossible due to the strict quarantine and limited resources. Therefore, this thesis only uses publicly available secondary datas, such as existing indicators and guidelines related to sustainable cities from international organizations, which would be adjusted to the characteristics of Central Asian cities by using datas from Bishkek covering the public policy of Kyrgyzstan, as well as economic, social, and enviromental aspectof it after the dissolution of USSR era.

In order to create the indicators of sustainable cities for Central Asian cities, this thesis will apply content analysis to the national policy and compared it with global indicators such as UNDP SDG 11 Sustainable Cities and Communities, Arcadis Sustainable Cities Index (SCI), and EBRD Green Cities Action Plan (GCAP). Then it analyses the urban condition of Bishkek in the framework of PESTEL by looking at the real-life datas from local sources covering the economics, social, and enviromental aspect of Bishkek after the dissolution of USSR era. By the end of the study, the new set of sustainable city indicators for Central Asia is established by adjusting the existing sustainable city key indicators with Kyrgyz national policy and the real urban condition of Bishkek. Finally, the new set of key indicators could be used as the base to propose policy recommendations to fill up the gap between the ideal theory and reality.

1.7 Thesis structure

This thesis is organized in five chapters: chapter 1 consists of the introduction of the study; chapter 2 considers the literature relevant for the study; chapter 3 gives the description of the conceptual framework and the methodology used in undertaking the research; chapter 4 covers the analysis results and discussions of the data collected through secondary resource; and chapter 5 concludes the study as well as proposes some recommendations.

CHAPTER II LITERATURE REVIEW

In order to back up the research with strong baseline, literature review was conducted by looking at necessary theories and previous studies regarding sustainable cities. In this part of the thesis, the definition of sustainable cities is determined to make sure that there is the same understanding on this issue. The existing indicators for sustainable city are discussed in order to have a strong baseline of sustainable city's main aspects. Finally, the characteristics overview of Central Asia will be explained to give a general idea of the region.

2.1 Definition of Sustainable Cities

City is an important element to achieve sustainable development as there is a global trend of urbanization happening in this era. It means that majority of people will live in urban areas in the future. Major economic activities also happen in cities, this makes urban sustainability become an essential and relevant topic when it comes to sustainable development. The growing issue of sustainability has brought us to the new term of sustainable cities. In a broad perspective, sustainable cities can be defined as cities that are not only resilient, but also be able to adapt to, mitigate, and promote economic, social, and environmental change (World Bank, 2019). In order to be a "sustainable city", it requires investment in public transport, green public spaces creation, as well as improvement in participatory and inclusive urban planning and management. Making cities sustainable means creating job and business opportunities, safe and affordable housing, and building stable communities and economies (UNDP, 2016).

"Urban Sustainability" can be described as a city organized without unnecessary dependence on the surrounding countryside and capable of being powered by renewable energy sources. This is aimed at creating the smallest possible ecological footprint and producing the lowest possible amount of pollution, using land efficiently, composting used materials, recycling or converting waste to energy and minimizing the overall contribution of the city to climate change (Siemens UK, 2019). It is one of the goals the global world trying to pursue which has been written in the Sustainable Development Goals 11: establishing inclusive, safe, resilient and sustainable city (UNDP, 2016).

In this thesis, the term of Sustainable Cities is defined as a city that is able to fulfill its development covering three main aspects; environment, economic, and social, without sacrificing one of them (UNDP, 2016).

2.2 Existing Sustainable Cities Indicators

Some of the existing indicators for sustainable city that would be used as a base in this thesis are UNDP SDG 11 Indicators, Arcadis Sustainable Cities Index (SCI) 2018, and EBRD Green Cities Action Plan (GCAP). These three indicators each represent a different perspective. The SDG-11 indicator focuses on the development of an urban environment initiated by the United Nations, and it means that this goal is agreed globally (UNDP, 2016). The EBRD GCAP indicator is used because Bishkek joined EBRD Green Cities program in 2019 together with Dushanbe from Central Asia (EBRD, 2018). However, up until the time this thesis is written, there is still no "green city" action plan document made by the Kyrgyzs government, thus, the researcher used the general guideline from EBRD GCAP in this study. Indicator from Arcadis SCI represents the view of the private sector that is focused in urban planning. This indicator is used by global cities but none of the cities originate from Central Asian region (Arcadis, 2018). The details of those three indicators are explained in the section below.

UNDP SDG 11 Indicators

There are a total of 10 Targets and 15 Indicators which have been defined by the UN for SDG 11. These targets and indicators specify the goals and the measurements by which the global world aims to trace whether these are achieved.

Table 1

Targets and indicators of SDG 11: Sustainable cities and communities

No.	Target	Indicator
1.	2030 : All citizens or residents receive unconditional access to decent, safe and affordable housing, as well as basic services and slum upgrading	Proportion of residents living in slums, informal or inadequate housing.
2.	2030 : Availability of a safe, affordable, accessible and sustainable transportation system for all people, especially those with disabilities	Proportion of population with convenient access to public transportation, build upon gender, age and disability.
3.	2030: Inclusive and sustainable urbanization	Ratio of land consumption rate to population growth
		Proportion of cities with direct participation structure of civil society in regular and democratic urban planning and management
4.	Protection of natural and cultural resources	Total expenditure per capita spent on the preservation,

No.	Target	Indicator
		protection and conservation of all cultural and natural heritage, by type of heritage, level of government, type of expenditure, and type of funding
5.	2030: Decrease the number of fatalities and direct economic losses relative to global Gross Domestic Product (GDP) caused by disasters, with a focus on protecting the poor and people in vulnerable situations	Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population
		Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters.
6.	2030: Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality, municipal and other waste management	Proportion of urban solid waste collected and managed at proper final disposal
		The average annual concentration of fine particles (e.g. PM _{2.5} and PM ₁₀) in cities
7.	2030 : Provide universal access to safe, inclusive and accessible, green and public spaces, particularly for women and children, older persons and persons with disabilities	Developing areas are generally in the form of public open spaces, which provides convenience for all genders, ages and people with disabilities
		Proportion of people who have been victims of physical or sexual abuse, by gender, age, disability and place of occurrence, in the past 12 months
8.	Support positive economic, social and environmental relations between urban, suburban and rural areas by strengthening national and regional development planning	Proportion of population living in cities implementing the urban and regional development plans which integrate population projections and resource requirements, based on the size of the city
9.	2020 : Increase the number of cities implementing the Sendai Framework for Disaster Risk Reduction 2015-2030	Proportion of local governments implementing the Sendai Framework for Disaster Risk Reduction 2015-2030
		Number of countries that have national and local disaster risk reduction strategies
10.	Support developing countries by providing financial and technical assistance, so that they can carry out sustainable and resilient development through the use of local materials	Proportion of financial support provided to developing countries for sustainable, resilient and resource-efficient development through the use of local materials.

Note. UNDP, 2016

Arcadis Sustainable Cities Index (SCI) 2018

Arcadis is a Dutch public company working on planning consultancy field. It was founded in 1888 as *Nederlandsche Heidemaatschappij* which specifically reclaimed land in the Netherlands (Narula & van Hoesel, 1999). Over the time, the company continues to grow and merged with various other companies until it is now operating on a global level, mainly focused on urban planning. The principle of sustainability is emphasized by Arcadis in its company and this company also created Arcadis Sustainable City Index which is referred as SCI (Arcadis, 2019). This indicator is important as a representation of the view of private company in assessing sustainable cities.

Arcadis examined "People, Planet, and Profit" pillars for developing a ranking of 100 of the world's leading cities. It considers social, environmental, and economic sustainability to produce an indicative picture of the current and future health and wealth of the cities. This set of indicators assesses the urban sustainability based on citizen's perspective. People represent social aspects, Planet represents the environmental aspects, and Profit represents Economical aspects (Arcadis, 2018).

Table 2

Arcadis SCI 2018 indicators

PEOPLE PILLAR			
Indicator	Description	Source	Rationale
Education	Primary school enrolment (percentage of relevant age group enrolled)	World Bank, US Census Bureau	A good education system provides businesses with a skilled workforce and provides people with the opportunity to earn decent incomes.
	University rankings (sum of university overall scores by city)	QS World University Rankings	
	Percentage of population share with tertiary education	Eurostat, US Census Bureau, UNESCO	
Health	Life expectancy	World Bank	A good healthcare system is crucial from both a productivity and quality of life standpoint.
	Infant mortality (deaths before age 1 per 1,000 live births)	Eurostat, Center for Disease Control	
Demographics	Age dependency ratio	National statistics, Eurostat, World Bank	A large working age population is important in ensuring that various social systems can be wellfunded. It also reduces the strain on educational or healthcare systems
Income inequality	Gini coefficient	Various	Ensuring that a city's wealth is distributed fairly among the population promotes a more cohesive society with fewer social issues.
Affordability	A basket of consumer goods (as a share of GDP per capita)	UBS Prices and Earnings, Numbeo	The affordability of a city directly impacts the quality of life of its inhabitants on a daily basis.
	Residential rents (as a share of GDP per capita)	Numbeo	
Work-life balance	Average annual hours worked	Various	As incomes rise, people will increasingly aspire for more time for leisure and family-related activities. Cities that foster a

			workplace culture in line with these needs are better placed to attract top talent and succeed in the long term.
Crime	Homicides per 100,000 population	Various	Levels of serious crime have a major impact on a relatively small share of the population. However, high crime rates have spillover effects that extend beyond the immediate victims, for instance through less investment in an area or increased levels of stress.
Access to public transport Services	Bus and metro stops per km2	Various	With high levels of traffic congestion in most major cities, access to public transport is integral in allowing people to travel both for work and for leisure. This affects inhabitants' quality of life on a daily basis, but in a less fundamental way than the above indicators.
Transport applications and digital capabilities	Centre for Economics and Business Research (Cebr) score measuring digital capabilities for the public transport system (availability of city transport system on Google Maps, an app created by the transport authority, existence of digital ticketing)	Various	Incorporation of digital capabilities into a transport system makes using public transport easier in cities.
Cultural offerings	Number of 'things to do' on TripAdvisor	Trip Advisor	The range of attractions available in a city has an important effect on quality of life. However, this indicator is less integral to basic standards of living.
Cost of broadband	Cost of broadband as a share of GDP per capita	Numbeo	A fast internet connection is increasingly important in accessing a variety of services. However, broadband accounts for a relatively small share of individuals expenditures so this indicator has been given a relatively low weighting.
Digital public services (property tax)	Cebr score based on ability to make online property tax payments	Various	Since this is a binary indicator (either online property tax payments are available, or they are not), there is limited variation between the cities in the index
Wi-Fi availability	Crowdsourced score availability of free Wi-Fi	Nomad List	While accessing the internet in public areas is important, many people have access to the internet via their mobile phone or at home / in the office.
PLANET PILLAR			

Environmental degradation	Natural disasters, including droughts, earthquakes and extreme weathers	International Disasters Database	Many cities in the index are not significantly affected by natural hazards.
Urban open spaces	The proportion of urban open space relative to the area of the city is equal to 100%	Siemens Green City Index	Although this indicator is a determinant of quality of life, however, it is considered to be less fundamental compared to the other indicators with higher weights.
Energy	Energy consumption	Energy Information Administration	The all five indicators measure the central aspects of city's current environmental sustainability.
	Various sources of renewable energy	Enerdata	
	Energy consumption per \$ GDP	Energy Information Administration, World Bank	
Air pollution	Average particulate air pollution levels	WHO	
Greenhouse effect/gas(?)	CO ₂ emissions in metric tons (per capita)	CDP Cities	
Waste management	Solid waste treatment (conventional landfill vs. recycling)	Siemens Green City Index, World Bank	
	Treated wastewater	OECD, FAO (UN)	
Drinking water and sanitation	Access to drinking water (% of household)	UN, WHO	
	Access to improved sanitation (% of household with private toilet facilities)	UN, OECD, American Housing Survey	
	Risks to water supply	World Resources Institute, The Nature Conservancy	
Cycling infrastructure	Bicycles per capita and bicycle sharing schemes (Cebr Score)	MetroBike	By encouraging cycling and walking in the cities helps to reduce the amount of air pollution and eventually improve air quality
Incentives for electric vehicles	Encouragement from both central and local governments for the use of electric vehicles (Cebr score)	City government websites, International Council on Clean Transportation	The transition from automotive to electric vehicles is crucial to reducing air pollution as well as improving air quality in the future.
Technology with negative emissions - CCS	Carbon capture and storage facilities/projects	Global Carbon Capture and Storage Institute	Most CCS schemes are located outside the city, therefore this indicator is considered unsuitable to directly measure the environmental sustainability of the city.

Natural disasters monitoring	Includes mechanism and number of early warning systems, and availability of digital warnings (Cebr score)	UN Office for Disaster Risk Reduction	Since many cities in the index are facing natural disaster risk, this indicator only affects a portion of 100 cities.
PROFIT PILLAR			
Transport infrastructure	Traffic congestion	TomTom Traffic Index	A good transportation network will facilitate economic interaction and encourage the formation of a more integrated city. Although it cannot be assessed directly compared to the other indicators with higher weights.
	Railway infrastructure	World Metro Database, Metrobits.org	
	Customer satisfaction at airports	World Airport Awards	
	Economic opportunities from the transport sector	Financial statements of transportation service providers	
	Public transport funding	Regional Revenues and Expenditures Budget	
Economic development	GDP per capita	Brookings Institute, Cebr analysis	GDP per capita is a direct measurement of city's productivity. Besides, it also determines how much cities can invest in the future.
Ease of doing business	-	World Bank	Regulation and finance that facilitate business are important in providing sustainable growth.
Tourism	Number of tourists	Euromonitor, US Department of Commerce	The number of international tourists represents the city's attractiveness and how the city is exposed globally. In addition, it is also influenced by national borders of the closest countries.
	Number of tourists per capita		
Connectivity	Mobile cellular connectivity (customers per 100 residents)	International Telecommunications Union	Improvement of the digital economy will lead the city's digital infrastructure to become more substantive in increasing economic growth.
	Broadband connectivity (% of internet user population)		
	Importance in a global network	Loughborough University	
	Internet speed	Nomad List	
Employment	Number of people working in cities (% of city population)	Brookings Institute	This indicator helps to give an overview of the workforce productive capacity as well as the economic opportunities available to citizens.
Technology based university	Ranking of the best universities in the field of technology & engineering	QS World University Rankings	This is a primary measure of the level of innovation and technological development of a city.

research			However, the benefits of university research are sometimes intended for areas outside the city.
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Note. Arcadis, 2018

EBRD Green Cities Action Plan (GCAP)

EBRD Green Cities Programme is a promising international project that has developed its own set of indicators for evaluation of policies in cities and urban areas. However, the project is still in progress and the set of indicators is not publically available (EU, 2018). Green city initiative that have been established shows the urgency of the implementation of this program. Its development has become more comprehensive and systematic by connecting environmental issues with social and economic issues. The biggest challenge of this initiative is to bring it into an investment project that tends to focus only on one issue. There is also a lack of agreement on the term "Green City" itself seen from the many variants of existing programs and slogans.

- **Definition of a green city** (EBRD, 2016)

Green City focuses on how good the environmental quality is to maximize its socioeconomic benefits. Then the definition offered is as follows:

Green City is a city with high environmental performance on: i) environmental quality (air, water, soil and biodiversity), ii) resource efficiency (water, energy, land and raw materials) and iii) mitigation and adaptation to change climate, while maximizing contextual social and economic benefits (population, socio-economic structure and geographical and climate characteristics).

The Green City Approach is defined as the relevant "action" to maintain or improve environmental performance:

The Green City Approach is an integrated multi-sectoral process in which urban environmental challenges are periodically identified, prioritized and addressed through targeted investments and services, as well as related policy instruments aimed at increasing the city's environmental performance at an efficient and sustainable cost, and striving to maximize socio-economic benefits.

- **Green City Pressure-State-Response (PSR) framework (adapted from a framework developed by the OECD)**

At the methodology level, the Green City Pressure-State-Response (PSR) framework is proposed by OECD in the 1990s (EBRD, 2016). This framework identifies human activities that have an impact / pressure on the urban environment (transportation, energy, buildings, industry, water, solid waste, and land use) and change the state of their environmental performance. It is also looking at how the community responds to these changes through environmental, economic and social, as well as behavioral changes caused by human activities. There are three aspects which are covered by this framework; Environment, Economic, and Social.

Table 3

Green City Pressure-State-Response (PSR) indicators

Sector	Indicator	Sub-indicator
Environment	Quality of environmental assets	Air quality
		Water quality
		Land/Soil quality
	Stock of resources	Water resources availability
		Green space availability
		Biodiversity and ecosystems
Climate change risks	Mitigation (greenhouse gas emissions)	
	Adaptation (resilience to climate change risks)	
Economic	Economic growth and employment	Development of green city sectors contributes to GDP output and employment
		Innovation in green city sectors contributes to GDP output
	Economic resilience	Resilience to the impacts of climate change improves economic resilience
	Revenue and expenditure	Green infrastructure and services provision, financial incentives, charges and taxes to promote green cities generate expenditures and revenues for a municipality
Social	Public health	Improvements in water and air quality reduce public health issues
	Access to urban services (indirectly: poverty, equality)	Enhancement of the efficiency and coverage of water supply infrastructure/network increases access of such services for the urban population and may participate in poverty and inequality reduction efforts
		Enhancement of the efficiency and coverage of low-emission (in terms of air pollutants and GHG) electricity and heat supply network increases access of such services for the urban population and may participate in poverty and inequality reduction efforts
		Enhancement of the efficiency and coverage solid waste collection system increases access of such services for the urban population and may participate in poverty and inequality reduction efforts

		Enhancement of the efficiency and coverage of safe and energy-efficient housing increases access of such services for the urban population and may participate in poverty and inequality reduction efforts
		Affordable basic services for all the urban population may participate in poverty and inequality reduction efforts
		Enhancement of the quantity of green spaces increases access of such services for all the urban population and generate well-being
	Behaviour and awareness	“Green” behaviours increase the use of existing sustainable urban utility systems (transport, solid waste recycling systems)
		High public awareness on natural disaster risk enhances the civil society’s preparedness to such events
		Citizens with “green” behaviours are more likely to preserve habitats and ecosystems
		“Green” behaviours result in lower consumption of water and energy resources
	Citizen engagement	Involving citizens in green city planning processes helps to achieve public participation objectives and buy-in of the population
		Community involvement in green city actions (e.g. solid waste, nature conservation) can be an effective implementation means and provide social benefits
	Social resilience	Tackling the vulnerability of poor communities to natural disaster risk can have high benefits on a city’s resilience and avoid further urban inequalities
	Gender equality	Enhancement of the safety and accessibility of public transport participates in promoting gender equality

Source : EBRD, 2016

Green city benchmarks and priorities

Currently, the indicators and program prioritization of green cities are still very diverse and there is no uniformity that can be agreed upon. Inspired by Emerging and Sustainable Cities Initiatives (ESCI) from the Inter-American Development Bank (IADB) applied the "traffic light" filter. A traffic light screening is applied to each indicator to simplify the assessment (green light = high performance; amber light = medium performance; red light = low performance) and compare cities’ performance against established benchmarks or proposed indicative benchmarks (EBRD, 2016). Green city programs need to be adjusted by the context of national standards and laws. The steps are as follow:

- Technical assessments, experts and relevant officials prioritize green city challenges by using a "traffic light" filter on the PSR indicator.
- Prioritization of stakeholders: local experts and stakeholders verify and / or edit the challenges and actions of the identified green cities.
- Political assessment: formal assessment to give final priority to the challenges that must be faced and the actions that must be taken.

Methodology for the Green City Action Plan (GCAP)

- Green City Action Plan (6 months for introductory period): aims to develop and present the agreed development vision and objectives for a 10-15 year period.

- Implementation (12-36 months): execute the Green City Action Plan, break it down into concrete tasks, allocate budget, time and staff, and monitor the contribution of each measurement to the goals and targets set in GCAP.
- Reporting (3 months): to evaluate implementation achievements, provide a basis for deciding future policies and publications on the general public.

2.3 Overview of Central Asia

Before discussing about the city of Bishkek, it is necessary to look at this city in a macro context so that we can understand the roles, relationships and similarities of Bishkek cities with other cities in the Central Asian region.



Figure 1. Political map of Central Asia region. From *Caucasus Central Asia Political Map 2003*, by Mapsof.net, 2003, http://mapsof.net/uploads/static-maps/caucasus_central_asia_political_map_2003.jpg, by Mapsof.net is licensed under CC BY 1.0

Environment

Central Asia is a landlocked region that is shared by Kazakhstan, Tajikistan, Uzbekistan, Turkmenistan and Kyrgyzstan. Its nature stretches from Kazakh prairies in the north to the Aral Sea waterways in the south. Around 60% of its territory consists of desert, such as Karakum Desert in Turkmenistan and Kyzylkum Desert in Uzbekistan. Most of those desert areas are not suitable for agricultural land except for the area along the banks of Amu Darya and Syr Darya rivers, which

pass through Kyrgyzstan, Tajikistan, Uzbekistan and Turkmenistan. These two major rivers flow into the Aral Sea and supply the region's biggest water sources. In the eastern and southern part, this region is bordered by Altai and other high mountain areas which extend to Iran, Afghanistan and China (Wilson, 2017)

Central Asia has a very dry and relatively extreme climate with low rainfall so it depends heavily on Syr Darya and Amu Darya for irrigation. Scarcity of water has caused uneven distribution of population, with the majority of the population living along river banks or at the valley of fertile mountains in the southeastern part; only few live in arid lands in central and Western Kazakhstan as well as Western Uzbekistan and Turkmenistan (Lotha, 2018).

The region also experienced several environmental problems at the end of the 20th century which was mainly caused by the effects of rapid agricultural and industrial development, excessive dependence on irrigation, and Soviet nuclear weapons testing in some areas. Pollution due to the use of fossil fuels also severely injures the air quality in the cities. Limited water resources and polluted water sources are one of the most crucial topics and even become one of the reasons of regional conflicts. This has pushed many initiatives and forums to protect and expand nature conservation areas, such as the Global Snow Leopard and Ecosystem Protection Program in which 12 countries are involved. The existence of snow leopards in their natural habitat is an indicator of good environmental performance quality (Snow Leopard Working Secretariat, 2013).

Similarity of Central Asian Cities' Characterictis

The location of Central Asia at the center of the largest land in the world also creates challenges for mutual development. Their cities are located far from safe and efficient sea routes. Thus, even though this region is endowed with significant agricultural capacity and mineral resources, they still have to struggle in order to supply their products to the market at a competitive price compared to other countries that are not landlocked. Therefore, the development of trading routes and other infrastructure is the key; most of the influential powers there directly contributed to the local infrastructure development in several ways, especially Chinese Belt and Road Initiative as Central Asia holds an important role in the Silk route connecting Chang'an to Constantinople (Wilson, 2017).

Social Characteristics

The largest population in Central Asia reside in Uzbekistan, then followed by Kazakhstan, Tajikistan, Turkmenistan, and Kyrgyzstan. The geographical proximity in this region allows for cultural, economic and political relations. This encourages Central Asian people to integrate even when such diversity causes misunderstanding or competition, for example, Kazakhs and Kyrgyzs usually share a certain "sense of brotherhood" in similar traditions and languages. However, Kyrgyzs who are traditionally nomadic have long-standing competition with Uzbeks who tend to live permanently. In the present time, this dispute is concentrated on territorial claims and the ownership of water resources, it has even extended to cultural and ethnic competition (Smith, Sinor, Hambly, & Allworth, 2017).

Central Asia was once ruled by the Muslim caliphate, it brought Islam as the majority religion in this region, with most of its disciples being Sunni Muslims. All ethnic groups speak Turkic languages except for Tajiks, that mainly speak Persian. After being ruled by the Russian empire and followed by the Soviet Union, Russian influence reached the lingua franca system. Soviet power also affected the population growth in Central Asia until it expanded rapidly in the 20th century as a result of high birth rates and lower mortality rates due to the improvement in health care system (Rossabi, 2020).

Economy Overview

Central Asian economic activities are based on agriculture, industry, and mining. In the current time, Central Asian countries have quite imbalanced economic power. The International Monetary Fund (IMF) noted that last year in 2019, Kazakhstan's GDP reached 190,469 billion dollars while its neighbor, Kyrgyzstan, only reached 8,029 billion dollars. This issue is closely related to geographical and bureaucratic conditions of each country (IMF, 2019).

Nowadays, complicated process of bureaucracy hinders international trade advancement in five Central Asian countries; Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. These landlocked countries are highly depended on land transportation to sell their goods, which makes the cost relatively more expensive. Inefficient border procedures and customs processes result in extension of transport time by several days or even weeks. The slowdown in the trading process directly and indirectly translates to higher cost, and it will greatly impact small and medium-sized companies (GIZ, 2019).

Central Asia's compact geography creates a shared geopolitical reality. Located between Russia and China, the two most powerful and often rival countries, as well as regional ambitious forces such as Turkey, Iran, and India, result in strong external influence in Central Asia. This huge influence presents modern challenges and opportunities for investment as well as threats to cultural, political and territorial sovereignty (Wilson, 2017).

The large political powers interests in Central Asia is related to the oil and gas energy resources (Antunes, 2012). Those resources have the potential to bring the region into "a major global energy supplier" (Akbar, 2012). Moreover, world's great powers, such as Russia, China, and Europe, have a problem to connect with each other and Central Asia could fill the role as the connector between those regions, which makes it such a significant potential for their economic growth (Antunes, 2012).

CHAPTER III RESEARCH METHODOLOGY

In this chapter, the analysis method of this thesis will be explained. There are two analysis methods which are used in this thesis; Content Analysis and PESTEL Analysis. Content analysis is used to see the suitability of the national strategy and the existing sustainable city indicators, while the PESTEL analysis is used to explain the sectoral conditions of Bishkek. The details of each of the analysis will be further explained and discussed below.

PART A. CONCEPTUAL FRAMEWORK

3.A.1 Thesis Framework

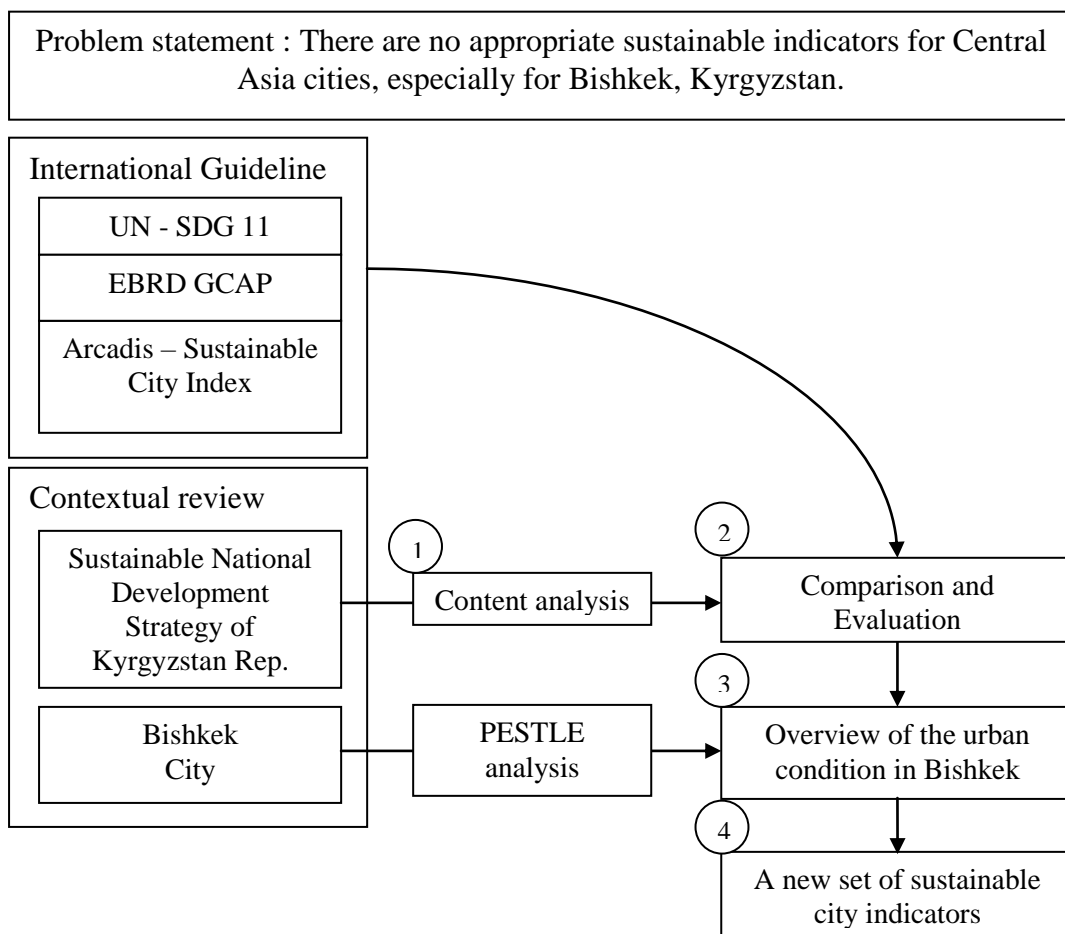


Figure 2. Conceptual framework. By writer

The framework in this study is based on the problem that there are no suitable indicators of sustainable cities in Central Asia, especially in Bishkek. To solve this problem the framework has 4 steps to compile it:

1. First, the researcher analyzes the contents of the NSDS document. It is important to conduct this analysis because the document contains a narrative about the national situation and the strategies on how to deal with it, but the indicators are not explicitly mentioned in the document. Therefore, the researcher used the document and constructed the indicators based on it. The result of the analysis is a list of key indicators derived from the strategy.
2. The second step is to compare the indicators in NSDS with the existing indicators from SDG-11, GCAP, and Arcadis SCI, to find the intersection and also to identify which indicators are not presented in the NSDS (but those indicators were found in the other three existing indicator), as well as the indicators which are only presented in the NSDS.
3. The third step is intended to adjust the indicators to the context of Bishkek with the PESTEL analysis. PESTEL is used to see the overall situation and the most important issues of Bishkek. The result of this analysis is in the form of a list of issues in related sectors that can be used as a reference for the new set of key sustainable city indicators.
4. The final step is to adjust the result of PESTEL analysis in step 3 containing the most important issues that need to be addressed in Bishkek with the result of step no. 2 which contains the comparison of the NSDS document with the existing indicators. The end result of this study is a new set of indicators that are suitable for Bishkek.

As what has been stated previously, the framework relies on content and PESTEL analysis. The details of the analysis are explained in the section below.

3.A.2 Content Analysis

In order to evaluate Bishkek sustainable policies, a certain method is needed to analyze the existing policy document. Qualitative content analysis is a method that is commonly used to study documents. This method enables us to measure and analyze the existence, meaning and relationship of certain words, themes, or even concepts by utilizing qualitative data. This methodology originally came from the social and health sciences. Damon M. Hall and Rebecca Steiner (2020) found that this method of analysis was rarely used to test and evaluate environmental policies (Hall & Steiner, 2020).

Krippendorff (1984) saw that qualitative content analysis is a process of deep reading of a relatively small part of the text which is then interpreted and contextualized in a new narrative. This method is included as hermeneutic study, which relies on the reader-response, so that it can be criticized.

Therefore, the study of criticism can be called "critical" not as a methodology, but rather a framework for thinking inside, through and outside the text, such as critical discourse, feminism, and post colonialism (Krippendorff, 1984).

In this thesis, the content analysis is used to review the substantial elements in the National Sustainable Development strategy of Kyrgyzstan in order to construct a set of indicators because the document is in the form of long narrative. Then it is used to compare the constructed indicators of NSDS with the aspects of sustainability from the existing indicators of sustainable city such as UNDP SDG11, Arcadis SCI, and EBRD GCAP.



Figure 3. The steps of content analysis in this study.

Content analysis in the NSDS document begins by reading the entire document and making a list of key indicators that are extracted from the narrative. The indicators are initially grouped according to the chapter of the document, then it is classified by grouping them into 3 bottom line aspects of sustainable development (environmental, social, and economic aspect) (, 200). The list of indicators is compared with the existing international references.

3.A.2 PESTEL Analysis

PESTEL analysis is an approach initially used in marketing techniques to see whether an industry can enter a certain macro market environment. The term PESTEL itself is an acronym of factors that are expected to influence objects, namely Politics, Economy, Social, Technology, Environment, and Legal. Examining Bishkek using the PESTEL perspective can make the reading becomes more comprehensive than the SWOT analysis. PESTEL is used to see Bishkek's general situation related to sustainable development. After the PESTEL analysis is conducted, the condition of Bishkek according to each other sectors can be identified, which gives an idea of the opportunity and the threat that should be addressed to ensure the sustainability principle.

In this method of analysis, a list of factors is intended to help and guide the PESTEL analysis in each domain. All PESTEL factors only have relevance in certain contexts. Therefore, it is necessary

to identify the influential factors and focus to analyze the effect of each of these factors (UNICEF, 2015).



Figure 4. PESTEL Analysis Diagram KnowledgeBrief

1. Political Factors, this factors explains the influence of local government in building a sustainable city. Some important things include:
 - a. Government policy: National, states/province, local, others
 - b. Allocation of resources by the government.
 - c. Political stakeholder demands.
 - d. Lobby or campaign by interest groups and political parties: local, national, international.
 - e. Influence or pressure from international actors, e.g. other countries' governments, international organizations, etc.
 - f. Armed conflict.
 - g. Changes in power, influence, and interrelation between relevant main actors or groups.

- h. Expected directions for future political changes: future policy prospects; upcoming elections and possible changes in government (local, state, national) and their consequences; other relevant political trends.
2. Economic factors, sustainability is also supported by the economic velocity of the city, the percentage of poverty and unemployment. whether the city is attractive to investors, and so on. This factor includes:
- a. Economic situation: local, national, regional, global.
 - b. The relevant economic situation of the community or specific population group (including employment, taxation, mobility, etc.)
 - c. Economic situation and related industry prospects.
 - d. Infrastructure: local, national, and others.
 - e. The financial situation of major partners or other related entities.
 - f. Availability of private sector resources relevant to the initiative.
 - g. Expected direction of economic change: economic trends, trade and market cycles; economic interventions expected by the government and their consequences; and other relevant economic trends.
3. Social Factors, this factor represents the social conditions of a city. One of them includes citizens who are proactive towards sustainable programs such as the presence of NGOs or volunteerism and public perspectives and mindsets on urban development. Social factors include:
- a. Demographic and population trends.
 - b. Public health.
 - c. Level of education.
 - d. Access to basic services.
 - e. Public perception (of a problem, initiative, organization or other actor).
 - f. Relevant customs, traditional beliefs and attitudes (eg towards the environment, and other emerging issues.)
 - g. Media portrayal.
 - h. The role of models, celebrities, influencers, and spokespersons.
 - i. Knowledge, attitudes and practices of certain population groups (related to relevant issues).

- j. Potential for knowledge transfer.
 - k. Migration (which also has political, economic and legal dimensions).
 - l. Some relevant important events (upcoming or ongoing) and cultural trends.
 - m. History, as long as it influences social attitudes and perceptions.
 - n. Factors in social identity, e.g. religion, socio-ethnicity, culture, etc..
 - o. The dynamics of how social change occurs in a given context.
 - p. Management style, attitude, organizational culture (in the main relevant organizations).
 - q. The direction of expected social change, trends in changing social attitudes (eg on relevant issues), other relevant social trends.
 - r. Credibility and accessibility of information sources and communication channels (eg media outlets, well-known individuals, etc.) among the target population.
4. Technological Factors, this factors refers to the advancement in technology and it includes:
- a. Access to technology for population groups.
 - b. Technology use patterns (which may change, e.g. Development of mobile usage).
 - c. New technologies that can significantly influence context, or which can be used to achieve goals.
 - d. Technology and related infrastructure, manufacturer or import requirements for initiation can still be carried out
 - e. Possible transition to alternative technologies
 - f. Potential for innovation
 - g. Technology transfer, access, licensing issues, other issues related to intellectual property rights.
 - h. Predictable trends in technology: economic and social impacts of the adoption of existing technologies; rate of technological change; and other trends in technology.
5. Environmental factors, this aspect includes all physical conditions of the city both artificial and natural, geographical location, climate and weather conditions, as well as planning documents, etc. Environmental factor includes:
- a. Contextually relevant environmental issues: global (eg climate change), regional (eg floods, drought, etc.) or local (eg contamination of water supply).

- b. Relevant environmental regulations or requirements (for example to assess the potential climate change impacts of certain activities, according to national or international environmental regimes, etc.).
 - c. Environmental impacts of planned or sustainable activities.
 - d. Climate, season and potential weather impacts.
 - e. Expected future developments or trends in the environment.
 - f. Geographical location
6. Legal Factors, this factor discusses whether there is a law that guarantees sustainability, both in the business industry, the environment, and other related sectors:
- a. Human rights
 - b. Existing laws have an impact on relevant factors (economic, social, technological, environmental or other factors relevant to this problem), or affect population groups that are relevant to the problem, or affect the work of the organization or its partnerships.
 - c. Pending or upcoming laws.
 - d. International agreements, both existing and under preparation.
 - e. Standards, supervision, regulations and regulatory bodies, and expected changes.
 - f. Ethical issues.

PART B. DATA COLLECTION AND ANALYSIS

This thesis work has been carried out in one of the cities in Central Asia, Bishkek, Kyrgyzstan. This research is based on the secondary data collection. More detailed information about this research is presented below.

3.B.1 Research Objectives and Questions

This research aims to identify the key indicators of sustainable city that is specifically adjusted to suit the context of Kyrgyzstan, especially for its capital Bishkek.

Research questions:

1. What kind of strategy is implemented by the government regarding sustainable development and is the strategy in accordance with international guidelines?
2. What are the most important issues in Bishkek urban condition?
3. What key indicators for sustainable city that are relevant for Bishkek?

3.B.2 Selection of Study Area

This study focuses on the city of Bishkek which is located in Kyrgyzstan. Among other cities in the Central Asia region, Bishkek is one of the capital cities of the country with the lowest GDP in the region and a high level of corruption (IMF, 2020). In addition, by the time of this thesis is written, the researcher is having an internship in Bishkek which makes the conduct of the study is more convenient.

3.B.3 Research Method

This study uses the content analysis method to gather indicators in the National Sustainable Development Strategy document for the Kyrgyz Republic. After that, all the indicators were categorized and compared to their existence with global indicators including USDG 11, EBRD GCAP, and Arcadis SCI. The study also integrates the context of Bishkek with PESTEL analysis. The results from the content and PESTEL analysis are then combined to formulate a new set of sustainable city indicators for Bishkek.

3.B.4 Research Sample

The research sample of this study consists of various documents, such as government's policy (National Sustainable Development Strategy of Kyrgyzstan 2013-2017) and documents from international organizations (UNDP SDG11, Arcadis SCI, and EBRD GCAP), as well as academic journals, reports, news, and online articles.

3.B.5 Data Collection

a. Source of Data

The source of data for this thesis comes from Kyrgyz's National Sustainable Development Strategy, Statistical Committee of the Kyrgyzstan Republic, State Agency for Environmental Protection and Forestry under the Government of the Kyrgyz Republic, United Nations Development Programme, Arcadis, and EBRD.

b. Methods of Data Collection

The method of data collection that is used in this thesis is fully secondary data collection. The researcher was unable to do the primary data collection due to the COVID-19 global pandemic.

c. Quality indicators

The researcher conducted an internship in Bishkek, under Silk Road Research Center at Ala-Too International University, which focuses on researching sustainable development in the Central Asian region. The internship is in line with the study, therefore, it helps the researcher to understand the urban sustainability of Central Asian region, especially Kyrgyzstan.

3.B.6 Limitations of Study

Limited sources of documents in English: Reports and research related to sustainable urban problems in the city of Bishkek are not widely available in English. The researcher is not a Russian nor a Kyrgyzs speaker, while most documents are provided in Russian or Kyrgyz including the newest 2018-2040 NSDS document. Therefore, researcher had to use the previous version of the NSDS for the period 2013-2017 because this one exists in English.

Unability to collect primary data: By the time this thesis was written, the researcher was residing in Bishkek in the middle of COVID-19 global pandemic. Therefore, the researcher was unable to collect primary datas from the interviews due to the quarantine and restricted social movements imposed by the government.

CHAPTER IV RESULTS

4.1 Content Analysis on National Sustainable Development Strategy (NSDS) of The Kyrgyz Republic 2013-2017 Document

The results of the selection of indicators that can be applied to the city scale is shown that in the five sectors. These five main sectors are the five chapters of the document. The economic development sector has the most indicators and then followed by the legal force sector.

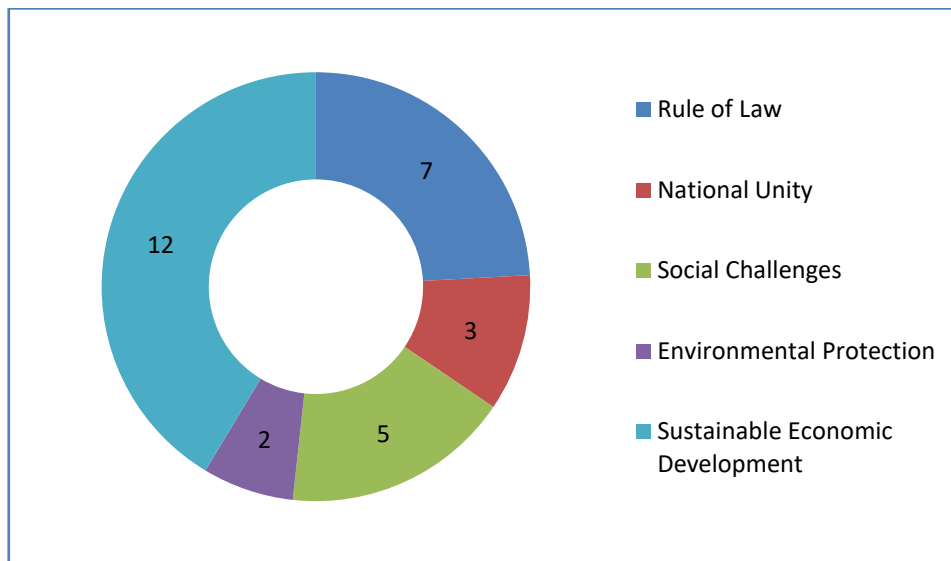


Figure 5. Number of Key Indicators in National Sustainable Development Strategy of Kyrgyz Republic.

After fully went trough the NSDS document, each chapter and its narrative are constructed into key indicators by the researcher. The following is a list of key indicators that have been tabulated from the NSDS document. We can see that the dominance of the indicators is in the economic development sector. This means that the national strategy prioritizes economic development before carrying out development in other sectors.

Table 4

List of key indicators of NSDS

RULE OF LAW
Strengthening of the legal system
Respect to the law and increase in legal culture of citizens
Ensuring free democratic elections
Combating corruption

ensuring transparency of governance
Strengthening cooperation between the government and the civil society
Development of local self-government
NATIONAL UNITY
Ensuring inter-ethnic accord through increasing unity of the people
Optimizing relations between the state and denominations and among denominations
Ensuring freedom of speech and formulating state information policy
SOCIAL CHALLENGES
Reform of the Education and Science System
Health Care Reform
Increasing effectiveness of social protection and pension coverage
Improving cultural environment, developing sports and youth initiatives
Increasing the role of the family and gender development
ENVIRONMENTAL PROTECTION
Environmental security and objectives of economic growth
Risk reduction and improvement of preparedness for emergencies
SUSTAINABLE ECONOMIC DEVELOPMENT
MACROECONOMIC STABILITY
<input type="checkbox"/> Achieving and maintaining macroeconomic stability
<input type="checkbox"/> Ensuring food safety
<input type="checkbox"/> Fiscal policy and public debt management
IMPROVING BUSINESS ENVIRONMENT AND INVESTMENT CLIMATE
<input type="checkbox"/> Reduction in the informal economy
<input type="checkbox"/> Enhancing the investment image of the country
<input type="checkbox"/> Ensuring sustained SME development
FINANCIAL SECTOR DEVELOPMENT
<input type="checkbox"/> Creating “long-term money”
DEVELOPMENT OF STRATEGIC INDUSTRIES OF THE ECONOMY
<input type="checkbox"/> Improve transport and communication network
<input type="checkbox"/> Developing tourism and service industry
ECONOMIC DEVELOPMENT OF THE REGIONS
<input type="checkbox"/> Reactivation of idle plants that use local raw materials
<input type="checkbox"/> Supporting priority economic industries of the regions
<input type="checkbox"/> Promoting domestic products from the regions on external markets

4.2 Comparison of Sustainable City Indicators

The content analysis is applied by looking at all the objectives and existing indicators of the 3 documents and the national policy (UNDP SDG11, Arcadis SCI, EBRD GCAP, and NSDS Kyrgyz Republic). Then, each point is grouped into 3 large groups of aspects; environmental, social and economic aspects. Each indicator's details and explanations are compared with each other. After

compiling groups of indicators, further analysis is done by comparing the presence or absence of these indicators in each document. This comparison is evaluated according to the advantages and disadvantages of each indicator with the the urban condition of Bishkek. The findings will determine proposed indicators for city scale in Kyrgyzstan.

Table 5

Comparison of the presence of the main indicators

Sector	Indicators	USDG 11	Arcadis SCI	EBRD GCAP	NSDS Kyrgyz Rep.
Environment	Natural Resource Protection	✓	-	✓	✓
	Reduction of impact on the environment	✓	✓	✓	✓
	Green space availability	✓	✓	✓	-
	Disaster Risk Reduction	✓	-	✓	✓
Social	Affordable Basic Services	✓	✓	✓	-
	Education	-	✓	-	✓
	Youth engagement	-	-	-	✓
	Public healthcare	-	✓	✓	✓
	Senior citizen service	-	-	-	✓
	Cultural Protection	✓	-	-	✓
	Inclusive and democratic urbanization	✓	-	✓	-
	Affordable Housing	✓	✓	✓	-
	Gender equality	-	-	✓	✓
	Safety open space	✓	✓	✓	✓
	Green Behavior	-	-	✓	-
	Corruption Free and law assurance	-	-	-	✓
Economic	Economic Development	✓	✓	✓	✓
	Reducing income inequality	-	✓	✓	-
	Employment	-	✓	✓	✓
	Green Revenue and expenditure	-	-	✓	✓
	Rural-Urban Integration	✓	-	-	✓
	Resource efficient development	✓	-	✓	✓
	Sustainable Bussiness and Tourism	-	✓	-	✓
	Connectivity	-	✓	-	-
Research and Technology	-	✓	✓	✓	

- UN SDG = United Nation Sustainable Development Goals
- Arcadis SCI = 2018 Arcadis Sustainable Cities Index
- EBRD GCAP = EBRD Green Cities Action Plan
- NSDS Kyrgyz Rep. = National Sustainable Development Strategy for The Kyrgyz Rep.

The table shows the comparison between 3 sustainable city guidelines and Kyrgyzstan's national development strategy. The four documents are analyzed whether there are similarities in content or differences in details. The result is there are many aspects of indicators that UN SDG does not provide. The SCI indicators given by Arcadis emphasize on the innovations and advancement. While EBRD GCAP provides essential and comprehensive indicators such as encouraging green behavior in the community and government but it prioritizes environment aspect more compared to the other two aspects.

The following are the main aspects from the existing indicators which are not included in the NSDS:

1. **Green space availability**, there are 4 key indicators in the environmental sector, only this indicator is not available. The NSDS is more focused on protecting the environment in order to maintain its economic value and to mitigate if natural disasters come (see Table 4.1). While the other 3 guidelines include this indicator in their .
- 2 **Affordable basic services**, there is no discussion found regarding meeting basic service needs in NSDS, such as electricity and clean water (see Table 4.1).
3. **Inclusive and democratic urbanization**, in the NSDS, there is no indicator that specifically regulates urbanization and the process of local decision-making that is democratic and inclusive (see Table 4.1).
4. **Affordable housing**, in the social sector, there is no provision of decent and affordable housing, the only point regarding housing is found in the Market Securities indicator for the implementation of the housing development program (NSDS, 2013).
5. **Green behavior**, it is not present in NSDS, though this indicator is only promoted by GCAP. In this case GCAP really emphasizes environmental aspect in sustainability (Table 2.5).
6. **Reducing income inequality**, there is no mention of income inequality in all of economic indicators in the NSDS.
7. **Connectivity**, this indicator is also not present in the NSDS, but it is only written in Arcadis SCI.

The following are the main indicators promoted in the NSDS but are not found in other indicators:

1. **Youth engagement**, this indicator is included in the 5 social challenges of the Kyrgyz Republic. Youth is considered as an asset of the nation's leaders in the future, which is why this indicator is promoted (NSDS, 2013).
2. **Senior citizen service**, this indicator specifically regulates retirement issues. Pension funds are assessed as long-term investments and guarantee social protection (NSDS, 2013).
3. **Corruption free and law assurance**, the NSDS has been prioritizing this indicator as there have been massive corruption practices and political instability in Kyrgyzstan (NSDS, 2013).

Overall, Kyrgyzstan's National Sustainable Development Strategy emphasizes social indicators that do not exist in other indicators, such as legal and political stability, corruption-free, senior citizen services and youth participation, which are suitable for developing countries. Unfortunately, the indicators provided by the state are too macro to be applied at the city scale. That strategy still needs to be detailed to suit the city of Bishkek. Indicators that have not been accommodated can be covered by international standards.

It can be considered that the role of government institutions is crucial to run a sustainable development program. The principles of good governance in SDGs and development inclusiveness in SDG 11 are the fundamental things for formulating the right policies. Unfortunately, this institutional indicator is not present in other references such as Arcadis SCI which is more suitable for developed countries and EBRD GCAP which focus on environmental quality.

The national strategic plan document actually started from the reform of government institutions. The level of public distrust in corrupt governments is very high both nationally and at the level of Bishkek itself, reflected by the number of development projects that do not work. Thus, the quality indicators of clean and stable government institutions become the main foundation for carrying out sustainable city development in Kyrgyzstan. After this indicator is present, derivative indicators such as community involvement in development can be implemented.

The issues of economic, environmental and social integration for urban and rural areas are present in SDG 11 but it is only briefly mentioned in the National Strategy. The big problem facing Bishkek is the explosion of internal immigrants which is actually the impact of disintegration and the development gap between Bishkek and rural areas in Kyrgyzstan (Sanghera, 2010). Immigrants

occupied the lands in the suburbs and raise new problems; crimes, inadequate settlements, limited social services (education and health), increasing basic needs (clean water, electricity, and heating) where the infrastructure network is not available. Those issues also increase the case of soil and air pollution rapidly.

The emphasis of SDG 11 on the availability of adequate housing is not mentioned in the National Strategy. This means that government agencies are still not focused in handling the housing crisis properly. Internal immigrants who inhabit the informal region continues to grow but there is no clear policy and legal umbrella. These slums areas continues to grow which contributes significantly to the consumption of fossil fuels for electricity and heating. This causes air pollution to exceed dangerous limits at the end of 2019.

The lack of health facilities and inadequate sanitation networks resulted in high rates of Covid-19 patients in slums. Poverty and high unemployment rates make this community even more vulnerable. The national strategy seems to prioritize services more for senior citizens and youth, although these groups are important, it is also necessary to improve services for vulnerable communities.

4.3 Bishkek in PESTLE Analysis

The results of the PESTEL analysis shows that some of the points within the PESTEL framework are not relevant for Bishkek, thus, the researcher only presents the issues that are significant for Bishkek.

Kyrgyzstan experienced many difficulties in their first years of independence. Economic restructuring, agrarian reform, and privatization of public properties have increased the number of unemployment in the country. This issue had become the trigger for internal migration to their capital, Bishkek. A lot of new settlements have sprung up around the city and this situation has worsened and slowed the development of the city (Atambayev, 2014). Through PESTLE analysis, the issue would be explained in detail as follows.

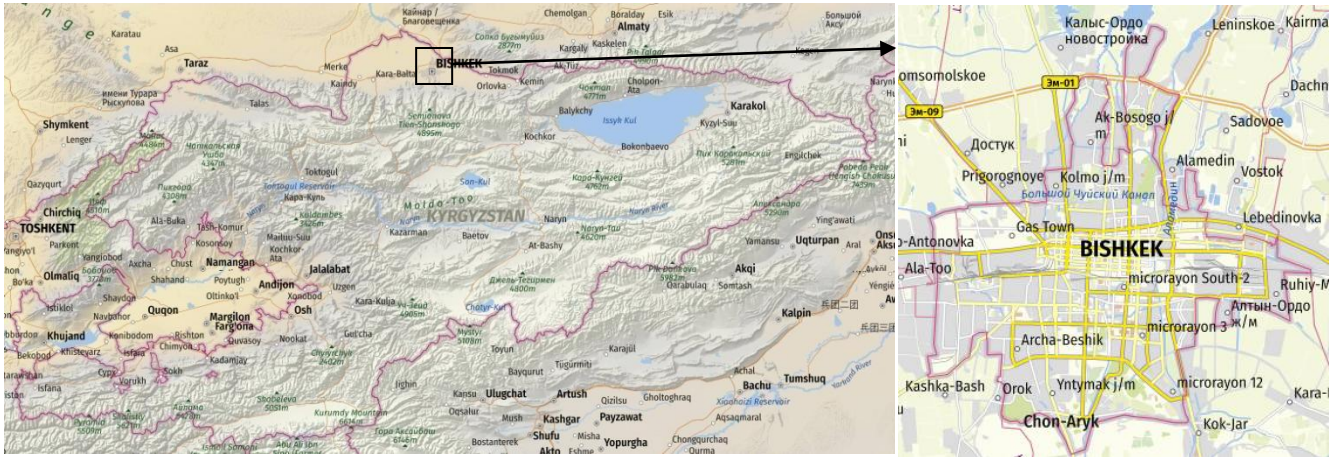


Figure 6. Mapz.com, 2020

4.3.1 Politic

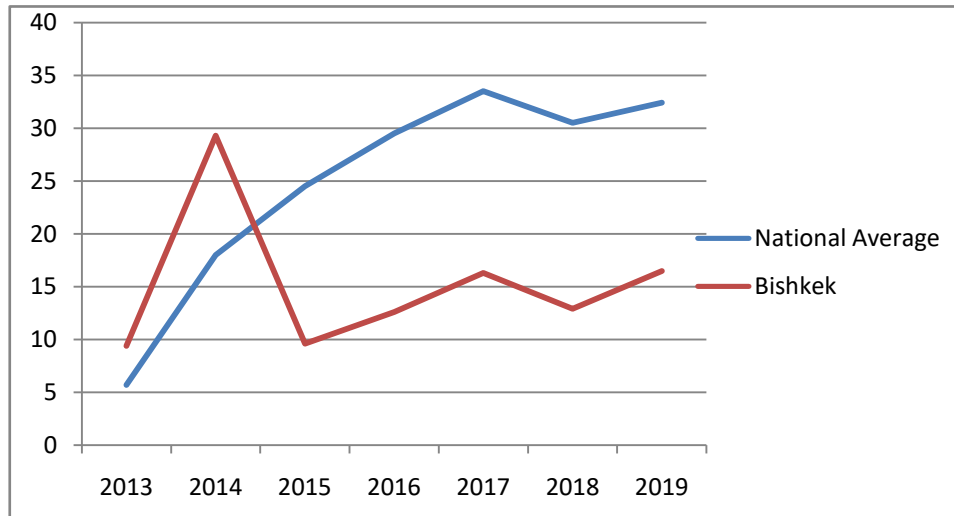
Bishkek's political position as the country's capital placing the city as a priority in development. This city also has been the location of various political events on a local to national scale. Since the dissolution of USSR, this country has experienced unrest in every turn of the head of state (Rica, 2019).

Armed conflict: In 2019, the arrest of former president Atambayev triggered riots involving the use of firearms in the north including Bishkek (Aivazov, 2019).

Changes in power: Political instability can be seen in the chart below where -2.5 is the highest instability number and Kyrgyzstan's score has always been negative. The overthrow of the President has occurred in 2005 and 2010 with arson attacks at the Presidential Palace. Clan politics, corruption, and pressure on the opposition has caused political instability in Kyrgyzstan (Schwartz & Khamidov, 2016). These problems have made a huge impact on public safety in Bishkek.

Regime change often translates to policy changes. Law reforms as well as executive reforms have continued to be carried out since the revolution. Since this country's independence in 1990 until today there have been at least 15 times of mayor changes in Bishkek. The average time for each mayor's turn was only 2 years, where it should have been 6 years per period. Three big riots occurred in 2005, 2007 and 2010, and in those same years, the mayor also changed. This caused a significant impact on the consistency of the city development policies. Up until now, there is no strategic planning document based on SDG that can be accessed by the public. The results of the executive agency evaluation index at the level of local authority place Bishkek's score below the national average in the past 5 years.

Figure 4.3 Executive agency evaluation index



Source: National Statistical Committee of the Kyrgyz Republic, 2020

Corruption is also a major problem for the implementation of sustainable development. International perceptions and the local public assess the handling of corruption cases is very low in this country which makes the development slow and insignificant.

4.3.2 Economy

Economic situation: Bishkek is the largest city located in the north of Kyrgyzstan. It has a direct land border with Kazakhstan, the highest GDP country in Central Asia. The location makes this city strategic because it is easier for the city to integrate with bigger economic market and center (FEZ, 2017).

Infrastructure: There is a land allocation called the Bishkek Free Economic Zone (FEZ) which currently stands on 489 hectares of land (which is 2.9% of the total area of Bishkek) in the Bishkek periphery, one of which is in the Manas airport area. The main objective of FEZ is to attract foreign direct investment (FDI), produce high quality goods for export purpose, create new jobs, apply the advance technology, focus on progress and profit, and contribute in improving the living standards of the population. However, out of five FEZs in Kyrgyzstan, only the ones in Bishkek and Naryn are functioning while the rests are not fully serving their purpose. In 2016, 65% of Bishkek FEZ products were used domestically but the zone was actually built for export potential. The peak of investment development in Bishkek FEZ began in 1998 then it gradually fell, only in 2016, with three large investors, the investment volume reached the same level in 1998. Employment rate at

Bishkek FEZ has also not changed in 15 years. There are only 10 workers per hectare and every year, the number of livelihoods in Bishkek FEZ decreases. Currently, only 329 out of 1,300 companies in the FEZ have registered with the Ministry of Justice and the Directorate General (Asia News, 2019).

The financial situation of major partners or other related entities: at present, many entities at FEZ are convinced of the need to radically change the work and management system in the FEZs in Kyrgyzstan. Only with the change, they will be able to make their own contribution to the country's economic growth, new jobs will be created and new investments will be made. Currently, investment entering Bishkek reached USD 2.17 million, it is still lower than Issyk-Kul region which has one of the main tourist attractions in Kyrgyzstan (NSC KR, 2020).

Table 4.2 Total incoming investment

egion	2013	2014	2015	2016	2017	2018	2019
Bishkek	1.884.702,3	2.224.458,0	2.197.716,2	2.214.813,3	2.853.875,2	3.006.466,0	2.177.259,3
Issyk-Kul	2.025.924,9	1.789.260,6	1.033.949,5	1.365.602,0	1.501.772,6	2.919.872,9	2.366.228,5

Source: National Statistical Committee of the Kyrgyz Republic, 2020

The Director of the Bishkek Investor Association of FEZ believes that frequent changes of the law in FEZ is the main cause of this problem. The promised working conditions only changes for the worst, so the investment is not guaranteed. Unfortunately there is no solution from the government. The Director General of Bishkek FEZ is obliged to protect the interests of investors before the state or other institutions and to assist in marketing the company, as well as releasing products to domestic and international market. However, the opposite happened. In one of the cases, the directorate's management sued a big investor from South Korea, lost in international justice court and paid a fine of USD 23 million. All this has damaged the image of FEZ and again, this led to the fall of FEZ investments for 10 times in 10 years (Asia News, 2019).

The main question is the use of funds collected from the subjects of the Directorate General, as of now, they receive 1% of member exports, 2% of sales to Kyrgyzstan, and 2% of rent on buildings and additional land. However, companies located in FEZ complain that there is no infrastructure

development. During the President's visit in July 2018, he instructed the Directorate General to address infrastructure problems through the Russia-Kyrgyzstan Development Fund, however, nothing has changed ever since (Asia News, 2019).

Expected direction of economic change. Manas International airport is predicted to connect Western Europe, Central and Southeast Asia, the Middle East as well as the Far East. It holds a huge potential to be a major transit point. This is proven by the recent agreement between the Kyrgyz and Chinese governments in the air corridor, as well as large investments by Japanese and German companies in the reconstruction of Manas Airport. However, Bishkek is the capital of one of the lowest income countries in the world. The lack of economic development, high unemployment and poverty that are publicly triggered by prolonged corruption, hinder the progress. The poverty rate in this city is fluctuating, there was a trend of a big increase in 2015 and a decline in the following year and then it continued to rise.

4.3.3 Social

Demographic and population trends: according to the most recent data in 2020, Bishkek's population has reached 1,053,900 people.

Public health: In general, there seems to be a trend of declining maternal and infant mortality rates. As well as increasing life expectancy from 65 to 71 years in Kyrgyzstan (National Statistical Committee of the Kyrgyz Republic, 2020). However, there is a significant issue of public health services in this country, which is the lack of funds resulting from ineffective and inefficient allocations. 80% of the funds allocated are used for labor and maintenance. The number of medical staffs is also very limited and uneven, it is mostly centered in the urban areas. The costs for medicines and nutritious meals for patients are only 20-25% of this allocation. Most of the medical equipments need to be upgraded and replaced. Moreover, massive corruption also occurs in this sector as proven from the lack of access to for most vulnerable groups (NSDS, 2013).

Level of Education: The results of the Programme of International Students Assessment (PISA) test in 2006 and 2009 showed that schools in Kyrgyzstan achieved very good indicators of school coverage and student attendance. However, around 80 percent of students do not have basic competencies. In addition, children in rural areas and from poor families had lower grades compared to those who live in urban areas and from well-off families (Rogers, 2018). In Bishkek,

the inequality in education sector is quite significant. Middle and upper income families send their children to private schools which have better qualities, whereas low income families and internal migrants who have no strong financial power had to send their children to the public schools with much lower qualities. Unfortunately, these poor families form the majority of the population in the city of Bishkek (Abdoubaetova, 2019) and this results in existing public schools being overloaded. According to the estimation from the Ministry of Education, Kyrgyzstan needs 670 more schools, while Bishkek needs 51. The number of teachers is also lacking and the workload is high. Teacher to student ratio is 1:52 and they are mostly underpaid with an average salary around USD 159 per month. These issues make the quality of school performance decrease significantly.

Migration: Since the collapse of the Soviet communal agriculture program, there has been a huge wave of internal migration from the rural areas to the city of Bishkek. These people from the rural areas settled informally (Sanghera, 2010). Gradually, the Russian and urban Kyrgyz-dominated Bishkek was eroded by the ethnic rural Kyrgyz.

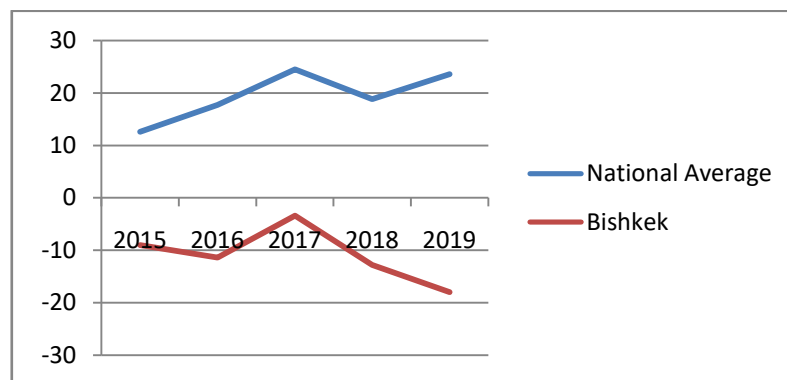
Access to basic services: The informal settlements in the suburban area where they live are called "new settlements" with a low level of hygiene. There is also a lack of basic public facilities such as schools, health clinics, electricity and clean water networks .

Factors in social identity (e.g. religion, socio-ethnicity, culture, etc.): Different from other regions, the problem of inter-ethnic relationships and beliefs are not very apparent in downtown Bishkek. However, the more it shifts to the suburbs, the more it can be felt. This is reflected in a survey conducted by International Alert. The survey showed that there was a sentiment towards conservative Muslims, especially during the years when extremism in the name of religion took place globally. According to the research, Islamophobia in Kyrgyzstan is initially formed on the basis of visual images associated with the religion, such as the hijab on women and beards on men. The older generation that grew up under Soviet anti-religious propaganda was found to be the most negative towards Islam and Muslims. Islamophobia is present among young people too, but to a lesser extent. Interestingly, Islamophobia in Bishkek has a very strong gender dimension, with women on both sides of the confrontation: non-Muslim women were more Islamophobic than their male counterparts, and Muslim women suffered more from Islamophobia than Muslim men (Alieva, 2018).

The dynamics of social change: There was a shift in ethnic domination which in the 1990s was dominated by Russia and now it is dominated by Kyrgyz themselves. Kyrgyzstan is a multi-ethnic country which is home to more than 100 ethnicities, and 27.8% of them are Kyrgyz (Ferdinand & Komlosi, 2016)

Public perception: the public perception of the local authorities of the city of Bishkek shows distrust and dissatisfaction with the government in dealing with corruption. An index of personal views on the level of corruption in local government executive authorities shows that among all other regions only Bishkek has a minus point and since 2017 has continued to decline until last year (NSC, 2020)

Figure 4.4 Index of personal views on the level of corruption in local government executive authorities



Source: National Statistical Committee of the Kyrgyz Republic, 2020

4.3.4 Technology

Access to technology for population groups: Access to information technology is quite easy and affordable in Bishkek. E-commerce penetration is in line with internet access speed, although it is still ranked 82nd in the world, the stability of the connection is quite reliable. This city has many internet and cellular users. The internet is provided via optical channels. More than 10 Internet service providers and 3 telecommunications operators work in this city. The internet covers almost 90% of city areas (Internet Society, 2015).

New technologies that can significantly influence context, or which can be used to achieve goals: In June 2019, the concept of "Electronic Bishkek City Hall", which is integrated town hall services in digital platform, was approved.

Potential for innovation: Almost all research and development institutes in Kyrgyzstan are located in Bishkek. There are 25 institutions of higher education, business and industrial centers, which makes this city has the highest level of technology exposure compared to other cities in this country.

Technology transfer: The use of devices and software for conducting real-time surveys to support sustainable development has been used here and in remote areas. As what is written in the National Strategy Implementation program for the Statistical Development Project, good data quality and high precision of electronic-based survey make it easy to develop policies that are realistic and efficient.

Predictable trends in technology: economic and social impacts of the adoption of existing technologies: The ease of non-cash payments is facilitated with devices that are easy to use and available in various public spaces. However, The COVID19 outbreak has proved that Bishkek still needs to enhance its internet service. The pandemic encourages the application of e-learning education models for all students, but the quality of the service deteriorates when there is a huge increase of the demand (Orlova, Ministry of Education organizes distance learning for schoolchildren, 2020).

4.3.5 Environment

Contextually relevant environmental issues: The problem of air pollution in the capital has become a major problem in the weeks before the arrival of the Corona Virus outbreak. Without the need to use air pollution gauges, it appears the black smoke rising in the city raises the anxiety of citizens (Orlova, 2019)

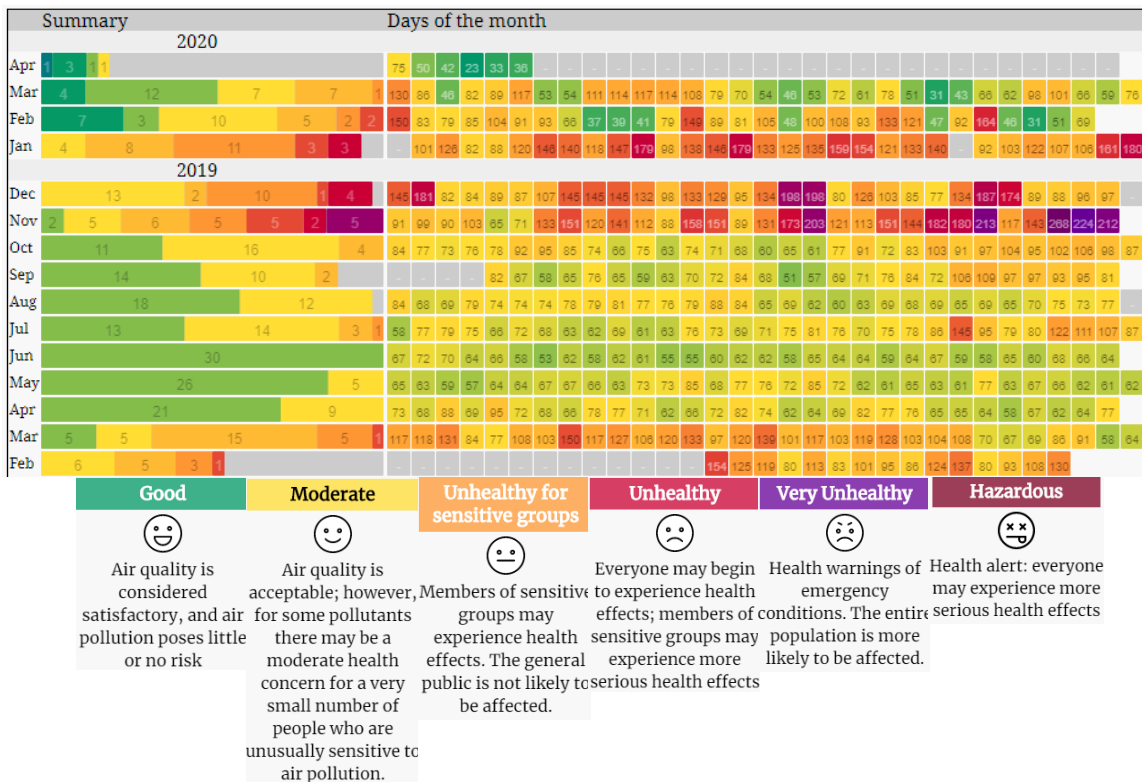


Figure 7. Waqi.info, 2020

According to World Health Organization (WHO) standards, the PM 2.5 level should not exceed 10 mcg/m³ and for the average daily it should not exceed 25 mcg/m³ while by country the limit is 35 mcg/m³. This indicator is used to check whether the air in Kyrgyzstan is polluted as well as the degree of the pollution. From November 2019 to March 2020, this number has reached 90-100 mcg/m³, and even above 200 mcg/m³ (AQI, 2020).

This air pollution is exacerbated by the construction of informal settlements in Bishkek suburban areas which mainly use coal-fired heaters. The smoke from the burning coal pollutes the air and increases the pollution. Coal Handling Plant (CHP) burns low-quality coal and there were reports that one of the CHP chimneys had been significantly shortened. It made the smoke and the dust covered the city as Bishkek is located at the valley of the mountain where the wind moves from the mountains to the city. In the present time, the situation of the city is changing rapidly, tall buildings are being built in every corner, the number of outdated vehicles with old engines are increasing every year. Furthermore, the number of tailor industry is increasing in Bishkek. The waste from those businesses was burned and it worsens the air quality. The city government has not provided information to the residents despite criticism and suggestions from *Jogorku Kenesh* (city council)

representatives. The community doubts that the government has taken any action to overcome the problem (Elgezit, 2019).

Problems in informal settlements are increasingly spreading until the point they occupied areas that are dangerous to inhabit because of gas pipelines. The formalization attempt of settlements in this region was rejected by the government. The lack of access to basic services makes this settlement turn to slum areas. Electricity and heating needs are increasing but the low purchasing power made them can only afford electric power generators and heaters which use fossil fuels and eventually it increased air pollution. Moreover, there is a limited access to public transportation from the suburban to the city center, the only transportation mode available is *mashrutkas*, which are old vans from the Soviet era, and the emission from these old vans worsened the quality of air in Bishkek (Elgezit, 2019).

4.3.6 Legal

Existing laws have an impact on relevant factors: From the legal perspective, continuously amended policies and legislation are one of the serious problems that is experienced from both the national to the city-scale level. This problem had caused constitutional instability throughout the nation. However, the new Bishkek Planning Agency was established last year in 2019. This institution was built in hope that Bishkek city planning can focus on designing future Bishkek which can meet SDG principles (Stiftung, 2018).

Conclusion

All of those six factors of PESTEL share some common intersections of problems in Bishkek, namely bad governance, corruption, nepotism, as well as legal and political instability hampering overall development initiatives. Even though an attempt for open governance had been applied, the management and the implementation are still poor. The previous experience of two major revolutions had at least given hope that there is no indication of authoritarian power but rather the consensus of various parties. There is great potential to increase the capacity of the community in organizing themselves, gaining access to information and involvement in the development process which is itself an opponent of corrupt governance.

Table 6 PESTEL Analysis of Bishkek

Factors	Facts	Threat/Opportunity
Political		
Armed conflict.	Arrest of former president Atambayev triggered riots involving the use of firearms. (Aivazov, 2019).	Threat: riots and armed conflicts will endanger citizen's safety and national security
Changes in power.	Political instability	Threat: political instability resulting in inconsistent policy
Economic		
The financial situation of major partners	Investment entering Bishkek reached USD 2.17 million smaller than Issy-Kul Region investment (National Statistical Committee of the Kyrgyz Republic, 2020).	Opportunity: encouraging entrepreneurship and economic growth.
Infrastructure	There is a land allocation called the Bishkek Free Economic Zone (FEZ) which currently stands on 489 hectares of land (which is 2.9% of the total area of Bishkek) in the Bishkek periphery, one of which is in the Manas airport area.	Opportunity: availability of infrastructure that can be utilized to increase employment.
Economic situation and related industry prospects	Kyrgyzstan is in the top 70 in ease of doing business better than Indonesia (World Bank, 2019). This is because of policies that protect minority investors.	Opportunity: attracting more investors to do business in Bishkek.
Expected direction of economic change.	Manas International airport is predicted to connect Western Europe, Central and Southeast Asia, the Middle East as well as the Far East (EBRD, 2017).	Opportunity: future development can enhance the role of cities as international hubs.
Social		
Public health.	Most of the medical equipments need to be upgraded and replaced. Massive	Threat: vulnerable group will be greatly affected if health services

	corruption also occurs in this sector (NSDS, 2013).	are not improved.
Level of Education	around 80 percent of students do not have basic competencies (Rogers, 2018).	Threat: there is a big chance that those unskilled students will become inept workforces or even unemployed.
Migration.	Since the collapse of the Soviet communal agriculture program, there has been a huge wave of internal migration from the rural areas to the city of Bishkek .	Threat: rural areas are no longer productive in terms of agriculture which could be harmful for the country's food security.
Access to basic services.	Lack of basic public facilities such as schools, health clinics, electricity and clean water networks in informal settlement (Rickleton, 2012)	Threat: a growing number of vulnerable people cannot improve their quality of life and increase poverty.
Social identity	There is Islamophobia exist around people (Alieva, 2018)	Threat: horizontal disintegration conflicts can easily occur
The dynamics of social change.	Ethnic domination shifting, which in the 1990s was dominated by Russia and now it is dominated by Kyrgyz themselves (Ferdinand & Komlosi, 2016).	Threat: it is easy for an unequal power relationship between the majority-minority dichotomy.
Public perception	People shows distrust and dissatisfaction with the local government in dealing with corruption (National Statistical Committee of the Kyrgyz Republic, 2020).	Threat: cannot build collaboration between government and citizens to encourage sustainable development.
Technology Factor		
Access to technology for population groups.	The internet covers almost 90% of city areas (Internet Society, 2015).	Opportunity: easy to increase economic growth and innovation.
Economic and social impacts of the adoption of existing	The ease of non-cash payments is facilitated with devices that are easy to use and available in various public spaces. The COVID19 outbreak has	Opportunity: facilitate small and medium businesses and encourage economic growth. Technology can reduce the cost of education.

technologies.	proved that Bishkek still needs to enhance its internet service. The pandemic encourages the application of e-learning education models for all students.	
Potential for innovation,	There are 25 institutions of higher education, business and industrial centers, which makes this city has the highest level of technology exposure compared to other cities in this country .	Opportunity: this city can be the center of the country's technological development.
New technologies which can be used to achieve goals.	"Electronic Bishkek City Hall", which is integrated town hall services in digital platform.	Opportunity: transparency and ease of access and monitoring of relevant authorities will increase public trust.
Technology transfer,	The use of devices and software for conducting real-time surveys to support sustainable development has been used here and in remote areas.	Opportunity: It makes it easier for development programs to conduct surveys with more precision and improved quality.
Environment Factor		
Contextually relevant issues.	Air pollution passes the tolerance threshold (Waqi.info, 2020)	Threat: reducing the quality of healthy urban life, risks for public health.
Legal Factor		
Existing laws have an impact on relevant factors.	Continuously amended policies and legislation (NSDS, 2013)	Threat: increasing risk for businesses, the public needs to make repeated adjustments and increase public dissatisfaction.

4.4 New Set of Key Indicators for Sustainable City in Bishkek

The strategic position of Bishkek can be utilized for economic development by setting up the land and air logistics route. The high number of donor agencies interested in investing in Bishkek can also be used as a major source of capital, however, the high level of corruption and frequent changing policies make donor agencies and investors withhold their funds. The emphasis on economic indicators is no longer focused on how high the growth rate is or on how green the business is, but on the transparency of the management of the government budgets and the stability of legal forces. Another potential is the application of technology that is above the national average. This will accelerate the development as it is going to be easier to monitor ongoing programs with real time data, but unfortunately, this indicator is not mentioned in the National Strategy. Therefore, based on the results of the analysis, the new set of indicator is detailed as follows.

Sector	Key Indicators	Sources	Rationale
Social	Affordable Housing Availability of affordable housing that meets decent living standards. This is seen from the number of residents living in slums, informal or inadequate housing.	SDG-11	There is a lack of the availability of decent housing is a significant problem in Bishkek but this indicator does not exist in NSDS.
	Access to Basic Services Access to drinking water, sanitation, electricity.	GCAP	Informal settlements in the suburban areas of Bishkek need basic services.
	Green Behavior Green behavior is a lifestyle of residents who are aware of environmental sustainability, such as non-renewable energy-saving behavior and decreasing the amount of energy consumption per capita.	GCAP	This indicator has been mentioned in a subindicator in the NSDS under the section of encouraging "green" businesses, but unfortunately it is not discussed as detail as in GCAP.
	Public healthcare Readiness of public health	Arcadis SCI	The public health services still has a huge concern due to the corrupt

<p>services in the face of a pandemic calculated from the amount of emergency funds and the availability of tools.</p> <p>Life expectancy and number of infant and child deaths.</p> <p>Proportion of population and availability of hospital beds and health workers.</p>	NSDS	institutions and basic services for vulnerable groups are still not available.
<p>Senior citizen service This can be seen from the proportion of the senior citizen in the city and the total expenses for life insurance for senior citizens.</p>	NSDS	It needs to encourage and facilitate old people by managing pension funds as an investment.
<p>Education Adequate number of good quality education as the opportunity to rise public well-being</p>	Arcadis SCI NSDS	There is still lack of educational institutions in quantity and there is also a disparity in the quality of education in Kyrgyzstan, especially in Bishkek.
<p>Youth engagement Facilitated youth initiatives can encourage economic growth, improve social problems and invest in future generations. Proportion of youth in the population Youth involvement can be seen from the budget allocated for youth programs.</p>	NSDS	Youth is considered as the asset for the nation, but unfortunately, youth engagement in Kyrgyzstan is still considered as low (NSDS, 2013)
<p>Gender Equality Gender equality in overall urban life. The decline in the number of sexual harassment and violence in public and domestic spaces. Security in access to transportation and other public services.</p>	GCAP, NSDS	There are many cases of domestic violence and inequality of income for women in Kyrgyzstan (UN Women, 2020).
<p>Cultural Protection Protection of all forms of cultural</p>	SDG-11	It is associated with the disintegration of racial identity, there

	works both tangible and intangible. Total expenditure for maintaining and preservation of cultural heritage		needs to be cultural protection in order to conserve the local values in Kyrgyzstan.
	Political Stability	NSDS	Political stability needs to be guaranteed, therefore there will be no frequent changes in government's policy.
	Inclusive and democratic urbanization Urban inclusiveness is the involvement of every level of society in the development and decision making of urban policies, regardless of ethnicity, gender, race and religion, including the involvement of vulnerable groups such as the disabled and minorities. This can be seen from the availability of participatory programs and structures as well as information disclosure and budget transparency.	SDG-11, GCAP	The low public trust in the corrupt government leads to the lack of collaboration and inclusiveness. This situation can affect the development as it can result in the government's failure to accommodate all of the needs of the citizens.
Environment	Natural Resource Protection Protection of water, soil and air quality, as well as biodiversity that lives in urban ecosystems which will be calculated from the total amount of expenditure for natural protection. The quality of water resources It will be assessed from the percentage of families that can access drinking water and sanitation.	GCAP	There is an urgent to protect the natural resources, especially water resources in Kyrgyzstan, in order the secure the water supply for the country, especially since Kyrgyzstan is a land-locked country.
	Reduction of Impact on the Environment Reduction of waste disposal amount and prioritizing recycling. Calculated from the amount of waste per capita and waste	GCAP, SDG-11	PESTEL analysis result shows that there is a severe environmental problems in Bishkek, especially regarding the air pollution.

	<p>management systems.</p> <p>Reduction of air pollution from industrial activities, vehicles and households. As long as the concentration of fine particles does not exceed health standards (PM2.5/PM10).</p> <p>Reduction of the use of fossil fuels by using renewable energy. This is determined by the variety of renewable resources used. Cost of per capita energy consumption.</p>		Therefore, it needs for indicators that can reduce excess air pollution.
	<p>Disaster Risk Reduction</p> <p>Disaster risk reduction can be seen from the government's implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030.</p> <p>This is calculated from the number of people affected by the disaster.</p>	SDG-11	Bishkek is included in seismic disaster-prone areas, therefore a good Disaster Risk Reduction strategy is needed.
Economic	<p>Economic Development</p> <p>This will be calculated from the GDP per capita</p>	Arcadis SCI	Economic development is a priority for the Kyrgyz government as presented in the NSDS.
	<p>Rural-Urban Integration</p> <p>Rural-Urban integration is useful for supporting and sharing each other's resources.</p>	SDG-11	The problem of internal migration in Kyrgyzstan, especially in Bishkek, is mainly triggered by the disintegration of rural-urban areas.
	<p>Employment</p> <p>This indicator looks at how much labor is absorbed and open unemployment and assesses city productivity and employment opportunities.</p>	Arcadis SCI	The low absorption of labor from internal immigrants results in the rise of unemployment.
	<p>Reducing income inequality</p> <p>Guaranteeing the distribution of wealth not to be controlled by a few people.</p>	Arcadis SCI	The term inequality is not included in the NSDS document, but in the PESTEL analysis the issue of inequality is apparent especially in

			the education sector.
	<p>Green Revenue and expenditure</p> <p>Revenues from taxes with green business certificates, green households, and expenditure are allocated to build green cities. Reviewing the Government's Revenue Budget.</p>	GCAP NSDS	It is important to build 'green' cash flow from upstream to downstream in order to minimize the severity of environmental issues in Bishkek.
	<p>Resource efficient development</p> <p>Encourage the use of labor, raw materials, and local resources in every development.</p>	SDG-11 Arcadis SCI NSDS	It needs to encourage the use of local labor, raw materials, and resources in order to encourage local economic growth and maintain money circulation.
	<p>Sustainable Business and Tourism</p> <p>Encourage the use of labor, raw materials, and local resources in every development.</p>	Arcadis SCI NSDS	This indicator is mentioned in almost all of the indicators documents. It needs to implement holistic sustainability in business and services.
	<p>Connectivity</p>	Arcadis SCI	This indicator encourages government transparency which helps to ensure the good governance.
	<p>Research and Technology</p> <p>Research from local universities will encourage innovation that can be applied in the city.</p>	Arcadis SCI	The allocation of research funds is terribly low that the progress of innovation in Bishkek is slowing down.

CHAPTER V CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The definition of sustainable cities are different from each institution and there is still no consensus on the term, which makes each of the existing indicators for sustainable city has different coverages even though most of them cover the three main aspects of sustainable development. Arcadis SCI focuses more on innovation which makes in accordance with the initiative of the city government towards Bishkek smart city and EBRD GCAP puts so much emphasize on the environmental aspects. Meanwhile, UNDP SDG11 is a bit more comprehensive but it focuses on the provision of housing and settlements. The National Sustainable Development Strategy for Kyrgyz Republic covers the issues which are relevant for Bishkek but there are some aspects of sustainability that are not covered in it, such as issue of informal settlements in the suburban areas of Bishkek by internal migration.

This study covers the creation of a new set of indicators which has been adjusted according to the characteristics of Central Asia using the case study of Bishkek. The new set of indicators consist of three main aspects of sustainable development (environment, economics, and social) with sub-indicators under each of the aspects as follow.

- Environment: Natural Resource Protection, Reduction of Impact on the Environment, Disaster Risk Reduction
- Economics: Economic Development, Reducing income inequality, Employment, Green Revenue and expenditure, Rural-Urban Integration, Resource efficient development, Sustainable Business and Tourism, Connectivity, Research and Technology
- Social: Education, Youth engagement, Public healthcare, Senior citizen service, Inclusive and democratic urbanization, Gender Equality, Green Behavior, Corruption Free and law assurance, Affordable Housing, Cultural Protection, Inclusive and democratic urbanization, Access to Basic Services, Political Stability,

This study could be used for further research in order to assess the sustainability of Central Asian cities. There is also possibility to analyze the priority level of sustainable indicators in a quantitative way that is contextual to the social, economic and environmental conditions of the city.

5.2 Policy Recommendations

Based on the result of the analysis, there are some policy recommendation that can be proposed to the government of Kyrgyzstan, in order to drive the development of their cities to a more sustainable path based on .

- It is necessary to improve the quality of governance in accordance with the principles of Good Government in order to ensure political stability and legal aspects.
- The government should conduct in-depth studies with universities and research center institutions in the city to develop sustainable policies on a city scale that is integrated with the region. The drafting of this development strategy needs to involve various networks of actors and layers of society including the vulnerable.
- In the healthcare sector, the government must ensure the allocation of funds effectively and efficiently, establish an accountable staffing structure in this sector, and prioritize the coverage of health services in areas prone to the spread of disease. In addition to improve the medical facilities in public hospitals, it is also necessary to attract opportunities for investment in medical sector, so that the capacity of the healthcare services can be increased.
- In the education sector, the government must prioritize the need for low-performing public schools and increase the access for low income families to a better quality education, as well as increasing the number of teachers and improving their well-beings.
- The government must continue to encourage innovation in the application technology for city development, integrate the urban planning process with advance technology, and collaborate with research institutions both at domestic and international levels.
- Bishkek City Government should fully commit to eradicate corruption practices by applying the principles of good governance, guarantee political stability in the city that is not easily influenced by national political conditions and ensuring the consistency of city development policies.
- There should be an optimization and restructuring in Bishkek FEZ in order for it to really attracts investment and create new jobs.

The city government must focus on improving the living standards of internal immigrants by providing adequate housing, clean water, sanitation, electricity and heating. The government should also establish affordable public transportation modes which are environmental friendly to integrate the suburbs with the city center.

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