Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Faculty of Landscape Architecture, Horticulture and Crop Production Science

Grading the ecosystem services

An analyze of the ecosystem services in the public parks of Tokyo

Amy Berggren

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Grading the ecosystem services

Ekosystemtjänstvärdering av Tokyos offentliga parker

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Sammanfattning

Detta är en masteruppsats på 30 hp som baseras på kusen *Master Project in Landscape Architecture* (kurskod EX0814) på masterprogrammet i Landskapsarkitektur på Sveriges Lantbruksuniversitet (SLU) i Alnarp i Skåne. Uppsatsen är gjord i samarbete med utbytesprogrammet mellan SLU och Chiba University i Matsudo kommun, i regionen Chiba, i Japan.

Målet med denna studie är att utvärdera ekosystemtjänsterna på vissa parker i Tokyo, Japan.

Innebörden av ekosystemtjänster och dess term har använts sedan 1976 då rapporten "Man's Impact On The Global Environment" släpptes. Rapporten tar upp olika synvinklar från meteorologi, oceanografi, ekologi, kemi, fysik, biologi, geologi, teknik, ekonomi, samhällsvetenskap och juridik (Knox, 1976). Ekosystemtjänster beskriver det vi som människor kan dra nytta av från naturen (Naturvårdsverket, 2018).

För denna studie så har ett specifikt utvärderingsverktyg för ekosystemtjänster konstruerats, baserat på tidigare forskning om ämnet. Av Tokyo stads alla 81 parker är ett urval av 11 stycken undersökta. Samtliga parker är besökta och värderade i ett poängsystem av mig. Dessa parker är sen stamanställda och jämförs avseende ekosystemtjänster grundat på frågorna i formuläret (benämns *Ecosystem Service Questionnaire*).

Slutsats i denna uppsats är att alla parker är välskötta och rena men det funderar inte optimalt när det gäller ekosystemtjänster. Det syns ett mönster i att de stora parkerna som fått högre poäng, och de små som fått lägre.

Studien visar att det kan finnas intresse för fortsatt och mer omfattande forskning när det gäller ekosystemtjänster.

Abstract

This is a masters thesis of 30 hp made in the course *Master Project in Landscape Architecture* (course code EX0814) in the programme *Landscape Architecture – Master´s Programme* at the Swedish University of Agricultural Science (SLU) in Alnarp, Skåne prefecture, Sweden. It was made in collaboration with a transfer student program at Chiba University in Matsudo, Chiba prefecture, Japan.

The aim of this study was to evaluate ecosystem services in some of the parks of Tokyo, Japan.

The meaning of the ecosystem services term has been used since 1976 when the report "Man's Impact On The Global Environment" was released. The report brings up different aspects from meteorology, oceanography, ecology, chemistry, physics, biology, geology, engineering, economics, social sciences, and law (Knox, 1976). The definition of the ecosystem services is what we, as humans, can gain and benefit from the nature (Naturvårdsverket, 2018).

An ecosystem service Questionnaire was created in this study and it is built on previous research on ecosystem services. A selection of the parks in central Tokyo gave 11 parks to analyze. Those parks where visited, graded with a points-scale, and compared together by me.

The conclusions of the study reveals that all parks in Tokyo where well maintained and clean, but it lacks effort in the terms of the ecosystem services. There is a clear division where the bigger parks that got the higher grade and the smaller parks that gets the lower grade.

There is a need for a wider and deeper continuing research in the subject of ecosystem services in Tokyo.

Table of contents

Introduction

The population of the world is steadily growing. The cities are getting denser and denser with people and buildings. Today, 54% of all the world's population live in cities. In just three decades, by the year 2050 the predicted number will be 66% (United Nations, 2015) Which means that two out of three people will live in cities. The first areas to make way for new buildings are the open spaces (Boverket, 2010). What happens when the cities expand, and the nature shrinks? Will we loose more than just the obvious visual greenery?

This report takes place in Tokyo, Japan, with the purpose of discovering how the nature is used, and how it gains the citizens in this - the worlds biggest - city. The target is public urban parks, the unified greenery that is kept inside the city, and how it benefits us as humans. By this result maybe we can change the way of defining the greenery.

Background

What is an ecosystem service?

The term *ecosystem services* refers to the benefits that our society receives from the ecosystems, in other words, what we actually can get from "the nature" (Naturvårdsverket, 2018).

The climate is changing. We need it to stop changing, if we want to proceed living as we do. The ecosystem services are needed to explain why we need the ecosystem. The service, the benefit, that we humans get from the nature. Those are things such as water and food, but also protection from natural hazards and the worst impact of climate change. But still, the governments and businesses of the world won't include the ecosystem valuation in the policy decision making (United Nations Environment, 2017).

To understand why we need a term for ecosystem services in the first place, we need to understand the climate change and its effect on us.

A sustainable living is made by using the natures services, to limit the negative effects on the climate. The IPCC, The *Intergovernmental Panel of Climate Change*, is an organization that was created in 1988 by United Nations and World Meteorological Organization to give the world the most recent, scientific and

socio-economic information about climate change (Intergovernmental Panel of Climate Change, 2013).

IPCC's latest report, the *Fifth Assessment Report*, says that it is the human influence that is the cause of the warming of the atmosphere and the ocean, the changes of the water cycle, the reduction in snow and ice, the sea level rise and the changes in climate extremes. During the last 30 years the surface of the earth has been warmer than any decade since 1850. And here, in the Northern Hemisphere, it has been the warmest 30-year period since of the last 1400 years back. Global warming is predicted to continue over the 2100-century and beyond (Intergovernmental Panel of Climate Change, 2013).

In December 2015 representatives from 197 countries all over the world gathered in Paris to make a climate agreement. This is the first time all countries of the world gathered for a common cause. The cause is – to combat the climate change and adapt to its effects. This session is called *The Paris Agreement.* All countries that sign agree to goals that keep the global temperature rise within this century to below 2° C than before the industrialization by humans started, and all parties agree to pursue their best efforts for pushing it even lower than 1,5° by using new and other techniques. The session noticed that the developed countries, those who began the industrialization, are most responsible to the climate changes. Today (2017) 152 out of 197 countries have signed on to this agreement. (The United Nations Framework Convention on Climate Change, 2016).

The meaning of the ecosystem services term has been used in academic literature since 1976 when the report of the "Study of Critical Environmental Problems" was released by J B Knox. The report is called Man's Impact on the Global Environment and describes how the humans living affect the global climate. It brings up aspects from meteorology, oceanography, ecology, chemistry, physics, biology, geology, engineering, economics, social sciences, and law (Knox, 1976). In 1997 G C Daily wrote a report called "Nature's services – society dependence on natural ecosystems" which describes the major services including climate regulation, soil fertility, pollination, and pest control, philosophical and economic issues of valuation, case studies of specific ecosystems and services and implication of recent findings and steps that must be taken to address the most pressing concern

(Daily, 1997). Many later reports have been written about how the decline of ecosystem service can be the cause of loss of income, food security and water availability. Changing natural habitats will create chain-reactions we can not predict (Millennium Assessment, 2005). Ignoring the effects of losing our ecosystem will cause big economic setback. We are relying on a working ecosystem, and the failure to recognize and account for the value of these goods and services in government and private sector decision-making has led to the unsustainable exploitation of ecosystems, triggering severe long-term social and economic costs which are increasingly reflected in insurance premiums, food prices, health incidents and even civil unrest (United Nations Environment, 2017).

Inside an urban area there are not so many ecosystems as there are in the wild nature. In a report by Bolund and Hunhammar (1999) these eight different habitats are listed as the key elements in an urban area.

- Street trees
  (Although the street trees are actually too small to be counted in as an individual item, and should be considered parts of a bigger system)
- Lawns / Parks
- Urban forests
- Cultivated land
- Wetlands
- Lakes
- Sea
- Streams

(Bolund & Hunhammar, 1999)

EXAMPLES OF SOME ECOSYSTEM SERVICES

The following part describes the ecosystem services that the questionnaire is based on.

Logs

Dead wood is important for the micro and macro fauna and flora and contributes to the sustainable biodiversity of a forest. Many species are dependent on the dead wood for their habitats. As much as 6 – 7000 species are found in dead wood habitats, and about half of them is missing today. It is especially important for species of bugs, mosses, birds and mammals (Dahlberg A & Stokland J N, 2004). Logs that are dried, or smaller branches can be used by humans as fuel, shelter or recreational play by kids or pets.

Food

Energy conversion into edible plants through photosynthesis. Examples are vegetables produced by urban allotment gardens and peri-urban areas (Gómez-Baggethun and Barton, 2013). It is important for both animals and humans. With even more flowering species there is a higher possibility for fruit, and that will give food to birds, insects and humans. The idea of bringing the food closer to the population is developing. To bring it to the people in the cities who are the ones using it (Cockrall-King, 2011). This benefits animals and humans as well, and increases the fauna diversity. Other food possibilities are fish, game, nuts etc (Costanza R et al, 1997).

Waterflow regulation

Soil and vegetation absorb water during heavy rain and prolongs the precipitation in those events. Percolation and regulation of runoff and river discharge (Gómez-Baggethun and Barton, 2013). Tokyo suffers from very heavy rain periods, sometimes 550 mm/hours during rainy season (Ichihashi, 2017). The parks and the vegetation are playing an important role in keeping the precipitation inside the soil and the vegetation. To prevent the sewages from being overly filled with storm water. If the soil, however, is too compacted, the water can not ooze into it. Roots can loosen the compaction of the soil, so the presence of trees are preferable (Bartens J et al, 2008).

Temperature

Trees and other urban vegetation provide shade, create humidity and block wind. The higher LAI the more efficient in photosynthesis, shading, and evapotranspiration (Gómez-Baggethun and Barton, 2013). Studies have shown that people seek shelter in of parks during summertime to escape the heat (Thorsson S, Honjo T, et al 2007). Groups of trees give more protection, than single standing.

LAI = Leaf Area Index: the mass of the leaves/unit. Example: Conifers have lower LAI, deciduous tree species have more. Dense tree groups have a high LAI, thin and single trees have lower LAI etc.

Noise

Absorption of sound waves by vegetation barriers, especially thick vegetation can prevent loud noises (Gómez-Baggethun and Barton, 2013). The higher LAI (Leaf Area Index) the more efficient in quieting the surrounding noises from outside the park. If the vegetation is *multi layered* (a lot of different heights close together) it is even more efficient. The vegetation on sides of the park, as a high and thick wall of greenery, is the most efficient.

Air

Filtering and fixation of some gases and particulate matter into the leaves. Removal and fixation of pollutants by urban vegetation in leaves, stems and roots is also possible (Gómez-Baggethun and Barton, 2013). The higher LAI (Leaf Area Index) the more efficient in capturing.

Extreme weather

A real physical barrier and absorption on kinetic energy. Storm, floods, and wave buffering by vegetation barriers help prevent weather damages (Gómez-Baggethun and Barton, 2013). Wind and flooding is a big problem in Tokyo during early summer time, when there is heavy typhoons and the rain season (World Weather & Climate Information, 2017).

Waste treatment

The removal or breakdown of the xenic (the presence of bacteria) nutrients. An effluent filtering and nutrient fixation (Gómez-Baggethun and Barton, 2013). It is shown as waste treatment, pollution control, detoxification etc (Costanza R et al, 1997). Results are found in laboratory when analyzing the soil.

Climate regulation

The carbon sequestration and fixation in the photosynthesis. Carbon sequestration and storage are done by the biomass of our urban shrubs and trees (Gómez-Baggethun and Barton, 2013). The greenhouse gas regulation, dimethyl sulphide (DMS, (CH3)2S) production is affecting the cloud formation. The carbon dioxide / oxygen (CO2 / O2) balance, the oxygen for UVB (sun rays) protection, and sulphur oxide (SO) levels (Costanza R et al, 1997). It is all due to the vegetation.

Vegetation biomass means the whole plant; leaves, branch, trunk, roots etc.

Seeds and pollination

The urban ecosystem provides habitat for the birds, insects, and other pollinators. A lot of species diversity gives an abundance of birds and bumble bees. Which proceed the movement of the floral gametes by biota (Gómez-Baggethun and Barton, 2013. Costanza R et al, 1997). The flowers and seeds also allow insects and birds to feed, and gives the aesthetics of wildlife to the park. This is the sexual reproduction of our plants. (Gómez-Baggethun and Barton, 2013) that is provisioning of pollinators for the reproduction of plant populations (Costanza R et al, 1997).

Recreation

The stakeholders use and reuse of the public space. The possibilities to freely do activities more than what is set in the design of it. The openness and welcome of multi-usage for all kinds of people independent of age, gender, or disabilities. The opportunity of providing non-commercial outdoor activities

such as aesthetic, artistic, educational, spiritual, or scientific values of ecosystems (Costanza R et al, 1997).

Animals

An abundance of birds, butterflies and other animals are not only valued for their aesthetic attributes by visitors, but also important for a healthy biodiversity and the circle of life. The urban green spaces provide the habitat for birds and other animals (Gómez-Baggethun and Barton, 2013).

The Millennium Assessment

To summarize how the ecosystem can benefit us as humans, The General Secretary of the United Nations at the time, Kofi Annan, initiated the "Millennium Assessment" in the year 2000. The report was created by 1360 experts from all over the world. The result holds six synthesis reports and five technical volumes and explains in a scientific way the conditions and trends in ours world's ecosystems and of the services they provide us humans (such as clean water, food, forest products, flood control, and natural resources) and the options to restore, conserve or enhance the sustainable use of ecosystems (Millennium Assessment, 2005).

The reports are free to download online, and to order as prints. They exist to add value to existing information by collating, evaluating, summarizing, interpreting, and communicating it in a useful form.

- Ecosystems & Human Well-being: Synthesis
- Ecosystems & Human Well-being: Desertification Synthesis
- Ecosystems & Human Well-being: Opportunities & Challenges for Business & Industry
- Ecosystems & Human Well-being: Wetlands & Water
- Ecosystems & Human Well-being: Health Synthesis

(Millennium Assessment, 2005)

TOKYO'S STORY

This chapter brings you closer to the islands of Japan, the climate and the people of Tokyo. It will give a meaning of its age and greatness, and a deeper understanding to why and how the selection of the parks are made.

Japan is combined and formed of almost 7 000 stratovolcanic islands (conical volcanoes made by hardened lava, ash etc.) and is often affected by volcanic eruptions and earthquakes. This makes the topography of Japan very elevated, with its highest spot located at Mount Fuji of 3 776 meter. The mountains are often very steep and rich in vegetation, which makes it hard to use for farming, industries and living. For this reason the cities in Japan are often located by the coasts and the mountains remain densely vegetated, covering 68,5% of the whole country area (Central Intellectual Agency, 2017). It makes Japan one of the most forested countries in the world (Japan National Tourism Organization, 2017).

10% of Japan's population lives in Tokyo's 23 wards. It is by far the most populated city in Japan. Its population of 13 million inhabitants far exceeds that of the second biggest city, Yokohama, with only 3,7 million inhabitants (and is only 1 hour away by local trains from Tokyo). The population of Japan is, however, predicted to take a significant downturn in the future due to the aging population and the decreased birth rate (Japanese National Tourism Organization, 2017).

Tokyo is located at 35 degrees latitude and has a humid subtropical climate with an average temperature of 25 degrees in summer, and 6 degrees in winter. The temperature rarely drops below 0 degrees. Humidity is high all year round and peaks in July with a monthly average of almost 80%. Precipitation is normally high, especially during the rain season which starts before the middle of June and lasts approximately 6 weeks. During that time typhoons (very strong wind) are common,

and with an average rain fall of 1530 mm/ year in Japan, June brings almost 200 mm. (World Weather & Climate Information, 2017).

Tokyo became the capital of Japan in 1868. The former capital, Kyoto, lost its title when the emperor Meiji moved his government to the city of Edo, which in that time changed its name to Tokyo (東 = east, 京 =capital). Tokyo is also the name of one of the 47 prefectures in Japan. In 1943 Tokyo City changed classification and officially became Tokyo Metropolis. What was former "Tokyo City" now became divided in 23 wards, and all all individual cities with their own leader. All 23 wards go by the name "special wards" (特別区) and are governed by the Tokyo Metropolitan Government. Outside of the special wards are the "Tama area" in the west and an archipelago in the far east, and all together the whole Tokyo metropolis holds 38 millions inhabitants (United Nations, 2015) and is the Top 1 most populated metropolis in the world.

The research in this thesis will be inside the 23 wards of Tokyo, and not to be confused with the whole Tokyo prefecture area.

The Urban Forest

Public open spaces and parks were not a common sight in Tokyo in the old days. The greenery was mostly around shrines and temples. But the first record of public greenery in Japan are from the 3rd century, when an alley of camphor trees were planted. To plant trees along streets and entrances to temples was an influence from Europe and became popular during the Meiji era (the Meiji era was 1868-1912). After the big fire in 1657, which destroyed most of the city's buildings and the castle keep, open spaces was designated to be placed as fire-breaks. The Shogunate government claimed three areas in the city in the 1720's, and then planted cherry trees on them for the pleasure of the citizens (Sheauchi C, 1999).

The parks of Tokyo took form as late as 1873 when the first parks Ueno, Asakusa, Fukagawa and Shiba were built. The concept of the more open western parks started during the Meiji era. The first park in that style was Hibiya Park that opened in 1903 and was designed by Seiroku Honda, a forester that had studied in Germany. He wanted the park to resemble the central park in New York (Sheauchi C, 1999).

When looking at the parks in Tokyo and how they are maintained, it gives a sign of careful cleaning of leaves and branches, and always short cut lawns. The bushes are always fresh with new buds, and no dead parts of branches or dead flowers. In studies from Paris is has been proved that low maintenance areas in parks, by other words, longer cut grasslands, branches and leaves left on the ground, dead parts left on the ground, gave the biodiversity a boost with more birds, pollinating bugs (Shwarts A, 2013) and more species in the grasslands as a result (Politi Bertoncini A, 2012). The number of species increased if they got cut more seldom, and peace from trampling by visitors by, for example, fencing some areas. Another contributing factor that gets forgotten when applying high maintenance in the parks, is that the natural regeneration is stopped (Hedblom M & Söderström B, 2008) when cutting closely into the stem on bushes and trees, and mowing the lawns. That means that the way of maintaining the parks in Tokyo, with high maintenance, leads to a lesser species diversity than a park with low maintenance.

Today, parks in Tokyo are very popular. The metropolis holds 7 877 parks in a total area of 5 721 hectares. The 23 wards however hold 81 parks that are under regular maintenance in an area of 1 980 hectares (Bureau of Construction, 2013). The types and sizes of parks are very different. They are usually divided into these four categories, defined by the size of them (Interview 2; Kinoshita I, 2017).

- Block Park
- Local Parks
- District Parks
- Comprehensive Parks

(Kinoshita I, 2017)

The biggest park in the 23 wards is called Mizumoto park with its 96,4 ha land, and the smallest are the block sized parks between the houses. The smaller parks are very common, and the bigger are very few.

In the account of green areas however, there are several bigger temple and shrine gardens which are not classified as parks but are open to the public during daytime. These serve the purpose of an urban forest in ecological and biological purpose. For example one big spot is Meiji Jingu Gyoen, a shrine forest made in 1920. The area holds 700 000 m² (70 ha) and was designed with 100 000 trees imported from Japan and overseas, where every tree is sincerely planted by hand in honor of the Emperor Meiji and the empress Shoken (Meiji Jingu, 2017). During World War II part of the forest and the shrine was destroyed, but soon got rebuilt.

The most recent park is Higashifushimi Park which partly opened for public in April 2013, and became Tokyo's 81st metropolitan park. The rest of the park will be constructed in cooperation with the improvement works on the Shakujiigawa river, and a new tunnel road. It is the first time a park, road and a river are integrated together in Tokyo (Bureau of Construction, 2017).

TOKYO'S GOALS

In 2020 Tokyo will be hosting the Olympic and Paralympic Games. For this event major changes in the infrastructure will be made, but the government also decided to upgrade the whole city. The release of the *"Tokyo Vision 2020"* made by Tokyo Metropolitan Government in December 2014, described the goals to "restore Tokyo to a beautiful city surrounded by water and greenery" as one of the main goals. The government aims to connect a network of the water and the vegetation in the new constructions. Starting 2010 and going over 10 years many new parks, with an total area of 170 hectares will be built, and the development of integrating the parks, roads and rivers will be promoted. 75 hectares of these will be designated for Disaster Management Sites. The plan continues after 2020 with future prospects, with descriptions of the basic objectives, policy targets with the specific roll-out policies and a 3-year execution plan (Tokyo Metropolitan Government, 2017).

The government goal for the city seems simple:

"Make Tokyo the best city in the World"

(Tokyo Metropolitan Government, 2017)

In an interview with a present employee of the Tokyo Metropolitan Government, Arata Ichihashi, he explained how the government thinks about the city planning. He explains that adapting is a thing that often takes time for the government. As tradition is a big part of the Japanese society, it reflects on the decisions the government makes. When there is a problem it is more natural for the government to look backwards and see what has been done before, instead of looking forward and try to approach new ideas. For the climate changes concern, the National Government just (fall 2016) created an adaptation plan, but that plan is unfortunately not an obligation for the local governments. (Interview 1; Ichihashi A, 2017)

Citizens of Tokyo

A former employee of the Park Department of Tokyo Metropolitan Government, Isami Kinoshita, explains how the government sees the value of the parks. He explains that the stakeholders, the people who live in Tokyo, are the ones that the parks are built for, not for the biology. The government usually doesn't prioritize the ecological values more than the aesthetic ones. They care more for the clean, artificial and beautiful parks, and of keeping them as they always have been rather than changing something. In this case, making it more in line with the nature. (Kinoshita I, 2017).

The change has to come from the people. But the government of Tokyo does not pay that much of attention to the citizens' wants. Some experiments and workshops have been made to embrace the nature and revive the natural habitats, and it is volunteers and students who make it happen. New parks with e.g. muddy features are created. The citizens, often parents, come with their children and realize how good it is for them with the wilder nature. So they choose these parks over the traditional ones for their children. When new ideas are made, it always first comes from the parents. (Kinoshita I, 2017)

The citizens of Tokyo are not used to having their voice heard. But there is actually a benefit for the population which is called "public comment". Not many know about this, because the government is not so keen on listening to them. Japanese people are not used to raise their voices, as opposed to people in the European countries. (Ichihashi A, 2017)

Framing of Issues

Main questions

- What kind of ecosystem services does the selected parks of Tokyo provide?
- What is the difference between the ecosystem services that the selected parks of Tokyo provide? Is there a connection between the differences?

Purpose of research

The purpose of the thesis is to evaluate ecosystem services in some of the parks of Tokyo. By using reports and research about ecosystem services, a simple questionnaire is created. I then use the questionnaire to evaluate and compare the parks, and finding the park in the city area with the best ecosystem service.

The report's structure

The text background is mostly a literature study, and two interviews with government and park department representatives. The thesis is written as an analysis of a questionnaire that is created by the author. The questionnaire is based on written reports about ecosystem service grading and the facts written in the background, it also involves a site study of the parks in Tokyo.

The questionnaire is answered by the author who grades the answers and transfers them into points, called "eco-points" on a scale made by the author.

All the parks results and eco-point are evaluated, compared and analyzed. When the analysis is made it is compared with the background facts and that is what gives the conclusions.

THEORETICAL BACKGROUND

The heaviest ground this thesis stands on are the facts combining the Questionnaire. Those are the text *Classifying and valuing ecosystem services for urban planning* in the report Ecological Economics by Gómez-Baggethun and Barton in 2013. The report *Ecosystem services in urban areas* by Bolund and Hunhammar from 1999. An urban forest inventory I took part in made by Björn Wiström in 2016 for the course *Theme course 2016 – Urban Forestry* (SLU).

Method

Time and place

The site study is made of parks in Tokyo, Japan. The parks were visited in the spring of 2017 (early - mid April). This is the time of blooming of the cherry blossoms, and is also the time of the Japanese spring break. This time was chosen to get the most information from the citizens' usage of the parks as all school children and many parents have spring holidays and will come to visit parks. The time of visit was from around lunch time to about 5 pm. This is when the local bell chimes and most people leave the park.

The chime is called 五時のチャイム (5pm Chime) or 市町村防災行政無線 (Municipal Disaster Management Radio Communication Network) and has historically been used to tell children to get back home, and also a way for workers without a watch to know what time it is (Gakuran M, 2014). At this time most of the people leave the park to go home.

The selection of parks

Since there are a lot of parks in Tokyo (7 877 parks (Bureau of construction, 2013)), some limitations had to be made. The parks selected are the ones that are the most popular with citizens and visitors, to get a wider perspective on the usage. This information is obtained via the public map service *Google Maps,* whose maps have worldwide coverage and over 1 billion users (D'Onfro J, 2015). Places visited can be rated by any visitor or citizen. Everyone who uses Google maps can rate any park. The rating changes every second, and the date of this data withdrawal was 2017-04-01.

Limitations

Limitations were made to only visit parks in the area of Tokyo's 23 wards (the old border of Tokyo as a city, see 'Illustration 2'). The purpose was to collect data from only denser urban areas, since the ecosystem of those areas has a harder way of

sustainability. Also it is where the parks are needed more, as there is more infrastructure and less/none wild nature.

To get the analysis of parks that is accessible to everyone, and thus a more diverse spread of people, there had to be parks with no entrance fee (this excluded each one of the traditional Japanese Gardens, which had gotten a high rating).

There are more ways to do limitations, but this is the one chosen method for the purpose of this thesis.

The structure of the Questionnaire

The parks were analyzed using a questionnaire made by me, specifically made for the purpose of this thesis. The questions are based on the texts "*Classifying and valuing ecosystem services for urban planning"* in the report Ecological Economics by Gómez-Baggethun and Barton in 2013, the report "*Ecosystem services in urban areas"* by Bolund and Hunhammar from 1999 and an urban forest inventory I took part in made by Björn Wiström in 2016 for the course *Theme course 2016 – Urban Forestry* (SLU).

There are 16 questions in the Questionnaire. Question 1- 12 are concerning the ecosystem services in the park in question, and question 13 – 16 are about the recreating possibilities and other social values.

The later questions will not be represented in the ecosystem chart because they are hard to evaluate in points, and are kept just as text. They are only in the questionnaire because of the over-all perspective and to give a fair vision and representation of the whole park.

The parks are all visited by me and thoroughly optically analyzed for 2 - 4 hours (depending on size). Each question is answered with text and a rating point. The points in this thesis are named *eco-points* and are graded in a scale of 1 – 5 ep, where 1 is the least good and 5 is the best. The park is also captured with pictures as a help in the analysis, and as a better visualization for the reader. The points are summarized in a diagram, which will give the park as a whole an *average point.*

The full questionnaires with pictures, full answer texts and rating points can be found in the Appendix.

THE INTERVIEWS

Two interviews are made and referred to in the thesis. The interviewees got my questions beforehand and at the meeting talked freely about the questions and other things concerning the subject. The interviews are recorded and afterwards transcribed by me. All transcripts are send back to the interviewees and returned approved for quotation and citing in this thesis.

THE PARKS

Name of the park, municipality

- Rinshi-no-mori, Meguro ward
- Kinuta Park, Setagaya ward
- Wadabori Park, Suginami ward
- Shakuji Park, Nerima ward
- Hikarigaoka Park, Nerima ward
- Arisugawa-no-miya Memorial Park, Minato ward
- Shiba Park, Minato ward
- Hinokicho Park, Minato ward
- Yoyogi Park & Meiji Jingu forest, Shibuya ward
- Ueno Park, Taito ward
- Mizumoto Park, Katsushika ward

Illustration 1: Tokyo; location of the visited parks

The Ecosystem Service Questionnaire

There are 16 questions. The question 1 - 12 are concerning the ecosystem service profit and are valued on a scale from 1 – 5, where 1 is the least good and 5 is the best. The question 13 - 16 is explained as free text.

(Questions are marked in *italic* letters, and the reasons they are in the questionnaire, and how they are graded are in the following paragraphs).

1. Are there logs that can be used, or dead wood left on the ground?

Many species are dependent on the now missing dead wood for their habitats (Dahlberg A & Stokland J N, 2004). Logs that are dried, or smaller branches can be used by humans as fuel, shelter or recreational play by kids or pets.

Eco-point grading:
1 = no logs at all are found
2 = just one log found
3 = a few logs found
4 = quite many logs found
5 = a lot of logs are found

2. Are there any food possibilities?

Energy conversion into edible plants for example vegetables produced by urban allotment garden (Gómez-Baggethun and Barton, 2013). With even more flowering species there is a higher possibility for fruit, and that will give food to birds, insects and humans (Cockrall-King, 2011). Other food possibilities are fish, game, nuts etc (Costanza R et al, 1997).

Eco-point grading:
1 = No food possibilities
2 = Just one fruit baring species / allotment area
3 = Some fruit baring species / allotment areas / farming etc
4 = More than 50% of the area with fruit baring species / allotment areas / farming etc
5 = Many and different fruit baring species / allotment areas / farming etc

3. Is there vegetation that can help with water flow regulation and runoff mitigation?

Soil and vegetation absorb water during heavy rain and prolongs the precipitation in those events (Gómez-Baggethun and Barton, 2013). The parks and the vegetation are important in keeping the precipitation inside the soil and the vegetation. To prevent the sewages from being overly filled with storm water. Roots can loosen the compaction of the soil, so the presence of trees are preferable (Bartens J et al, 2008).

Eco-point grading:
1 = No bare soil / too compacted soil
2 = Just a few vegetated areas
3 = Approximately half of the area is vegetated
4 = Mostly vegetated
5 = Vegetation everywhere

4. Is the park contributing to the temperature regulation?

Trees and other urban vegetation provide shade, create humidity and block wind, the higher LAI the more efficient in photosynthesis, shading, and evapotranspiration (Gómez-Baggethun and Barton, 2013).

Eco-point grading:
1 = Almost zero LAI/vegetation
2 = Just a few vegetated areas
3 = Approximately half of the area is vegetated
4 = Mostly vegetated
5 = A lot of vegetation to regulate the air, and densely together

Illustration 2: Example of high LAI

Illustration 3: Example of low LAI

5. Can the park help the noise regulation?

Absorption of sound waves by vegetation barriers, especially thick vegetation can prevent loud noises (Gómez-Baggethun and Barton, 2013). The higher LAI (Leaf Area Index) the more efficient in quieting the surrounding noises from outside the park. If the vegetation is *multi layered* (a lot of different heights close together) it is even more efficient. The vegetation on sides of the park, as a high and thick wall of greenery, is the most efficient.

Eco-point grading:
1 = Almost zero LAI/vegetation
2 = Just a few vegetated areas
3 = Approximately half of the area is vegetated
4 = Mostly vegetated
5 = A lot of vegetation to regulate the noise, and densely together

6. Is the park contributing to air purification?

Filtering and fixation of some gases and particulate matter into the leaves. Removal and fixation of pollutants by urban vegetation in leaves, stems and roots is also possible (Gómez-Baggethun and Barton, 2013). The higher LAI (Leaf Area Index) the more efficient in capturing.

Eco-point grading:
1 = Almost zero LAI/vegetation
2 = Just a few vegetated areas
3 = Approximately half of the area is vegetated
4 = Mostly vegetated
5 = A lot of vegetation to capture particles

7. Is the park contributing to moderation of environmental extremes?

A real physical barrier and absorption on kinetic energy. Storm, floods, and wave buffering by vegetation barriers help prevent weather damages (Gómez-Baggethun and Barton, 2013).

Eco-point grading:
1 = A flat area, almost no vegetation barriers, or rivers
2 = Some height differences / a small river / low artificial pond
3 = More than half of dense vegetation, low river / ponds
4 = Mostly thick and dense vegetation, deep rivers / ponds
5 = A lot of thick and dense vegetation, deep rivers / ponds

8. Is the park contributing to waste treatment?

Removal or breakdown of xenic (the presence of bacteria) nutrients. Effluent filtering and nutrient fixation (Gómez-Baggethun and Barton, 2013). Shown as waste treatment, pollution control, detoxification (Costanza R et al, 1997).

(This Questions subject needs to be done in a laboratory with soil samples, so the grading here is done with only optical investigation of for example leaves allowed to be left on ground)

Eco-point grading:
1 = No leaves left
2 = Just some leaves are left
3 = More than half are left
4 = Mostly left
5 = Leaves are left and kept close to the roots

9. Is the park contributing to climate regulation?

Carbon sequestration, fixation in the photosynthesis and storage done by the biomass of urban shrubs and trees (Gómez-Baggethun and Barton, 2013).

Eco-point grading:
1 = Almost zero vegetation biomass
2 = Just a few vegetated areas
3 = Approximately half of the area is vegetated
4 = Mostly vegetated
5 = A lot of vegetation biomass

10. Is the park contributing to pollination and seed dispersal?

Urban ecosystem provides many habitats for birds, insects, and other pollinators. A big species diversity gives an abundance of birds and bumble bees (Gómez-Baggethun and Barton, 2013. Costanza R et al, 1997). The flowers and seeds also allow insects and birds to feed, and gives the aesthetics of the wildlife to the park (Gómez-Baggethun and Barton, 2013).

Eco-point grading:
1 = No flowering species
2 = Some flowering species
3 = Some flowering species, for one or two seasons
4 = Many flowering species, for many seasons
5 = A lot of and different flowering species, for all seasons.

11. Is the park contributing to recreation and cognitive development?

The possibilities to freely do activities more that is set in the design. The openness and welcome of multi usage for all kinds of people (Costanza R et al, 1997).

Eco-point grading:
1 = No possibilities
2 = Just a few/one possibility
3 = Some possibility
4 = Many possibilities
5 = A lot of different recreation possibilities

Illustration 4: Example of seed dispersal

Illustration 5: An example of high recreating possibilities

12. What kind of animal sighting/signs can be found?

An abundance of birds, butterflies and other animals valued for their aesthetic attributes by visitors. Important for a healthy biodiversity and the circle of life. Urban green spaces provide habitat for birds and other animals (Gómez-Baggethun and Barton, 2013).

Eco-point grading:
1 = No animals / a few species
2 = Just a few animals / species
3 = Many animals but same species
4 = Many animals, some different species
5 = A lot of different animals, many different species

(The following questions are not evaluated by eco-points but in text)

13. Is the park accessible for everyone?

How the accessibility is available for people using wheelchair, baby strollers, etc. How the information and paths are created to help people with lower vision or hearing to get around.

14. What are the recreation possibilities in this park?

What people are seen or presumed doing in this park, how it is planned to be used and how it is used.

15. What is the atmosphere in the park?

How the people collectively see the park, and mutually respect that feeling. The impression of the area as a whole unit.

16. Other special features in this park?

What the park has to offer except for the biological values.

Results

Summary of the Parks

This is a summary of all the parks and the results the Questionnaire gave. The full report of each park can be found in the *Appendix.*

Rinshi-no-mori

The park is very popular and lively. The park is noticeably divided into a lively sports area, a family area by the playing equipment, and a calmer woody area. The pillar hall structure in one part gives an open and lively atmosphere, and the multi-layered woody area gives a more slow and quieter area. The park is quite thick with forest and mostly two layered. The experiment with underground tanks to prevent flooding is presumably very effective.

Special features include the amphitheater, a disaster toilet location, good cherry blossom spots and a splash pond for the warmest months. Solar charged lamps on some spots. Sign boards of trees makes the nature education easy and playful, trees have signs on them with Japanese name. A paddling pool for toddlers (open July – August). Graveled sports courts where at the moment soccer was played. Playground with bare ground and natural benches made of wood. Amphitheater/ meeting place is the middle, a quiet spot where event can be held. Disaster event toilets can be put up in this park. 10 + 15 ground sewage ready to get installed in separate areas in case of an evacuation is necessary, then the toilets will be useful. Heavy rain caption experiment. Most of the rain usually goes to the river, but in case of very heavy rain the well in the ground can hold some of the water and then let it slowly sink into the ground.

Average eco-point: 3,8

Kinuta Park

A very large and popular park, a bit far from the city center. The most attractive spots are the big lawns for sports and big lawn for calmer activities and cherry blossom picnic. The park holds a bird sanctuary where many different species of birds stay. The bird sanctuary has a 2 meter high metal fence with no entrance possibilities, which is good for the animal safety. There was, however, a wooded fence with holes cut at different heights, for viewing through. And a lot of signs explaining what types of birds can be seen here. A big bicycle path ran through the west side of the park. Some solar charged lamp posts.

The park has many big lawns and some tree areas. They are dense and high and give a wild feeling, but too neat and without floor vegetation to be helpful for the ecosystem services.

Average eco-point: 2,5

Wadabori Park

The park is calm and gives an impression of being a local neighborhood park. It is not so clean and the grass and bushes are unmaintained and grow high and freely. The feeling is that it is not prioritized by the maintenance organization. A fishing pool inside the park is a fairly popular attraction, but it is fenced and only open for paying members.

The canopy is partly open, partly closed. The trees are high and without a vegetation flooring. The grass on the open fields has almost completely disappeared due to many and rough sport activities over the years. The park runs along a river, and the walking path next to it has a beautiful canopy of many blossoming cherry trees, partly stretching over the river as well. The greenery continues far along the river but the park borders end this park quite suddenly. A pond in the middle with an unreachable (for humans) island gives a nature-like feeling.

Average eco-point: 1,8

Shakuji Park

A big park which is partly a free growing yet maintained temple forest and two big ponds. A big pond with high biological value called Sanpoji pond protected by the forest and a boarded walking trail around it, and a resting hut in the middle. The other pond is called Shakuji pond and has a boat renting facility, which makes the area more lively. Inside the forest there is a bird sanctuary which is more popular for birds than humans. There is a nature inspired playground with wooden playing equipment, sandpit and swings and a lot of big and tall trees, for shadow and to be part of a play. One part is designed with a flower bed area, a bush area and a cherry blossom area.

Many signs abound the pond explaining about birds and plants. One really old tree had a sign explaining that this was the "Tree of the ward". The bird sanctuary is protected by a 2 meter high fence and can not be entered by humans. There is a resting area with roof by the far side of the pond, with a very beautiful view.

Average eco-point: 4,2

Hikarigaoka Park

The square at the entrance of the park is popular for skateboarders and street performance artists. The lawns are hilly and large. There are many Hanami spots to choose from, like a grass lawn with low branches, or a more shadowy spot with older and taller trees. A playing area had more advanced playing equipment (a looped swing track, climbing wall etc). There are many sports courts for many different sports. There is a fenced protected forest with a very long jogging trail around the whole park, and a bird sanctuary.

The park is partly an evacuation lawn that can hold 200 000 people. Some lamp posts were charged by solar panels. A bird sanctuary with 2 meter high metal fence, on top of a 1 meter concrete wall decorated with metal barbs. One road into the park is full of cherry blossoms, and one is of only Gingko trees.

Average eco-point: 4,0

Arisugawa-no-miya Memorial Park

A clean and green elevated oasis in the middle of the city. The big pond and the thick vegetation gives a peaceful feeling. Many people pass this park on their lunch-break or for a stroll with their children. Some fishing men can often be seen by the pond, but the fish are not for eating as they are put back into the water after they are caught. Because of its location close to a popular shopping street, a library and an embassy in the area, many foreigners and young people are seen here in the park. A rippling waterfall and a quiet stream lead to the pond, which has a small island full of flowering trees in the middle. Many signs are put up with information about cherry tree species, birds and nature. The park is also set as an emergency evacuation spot.

Average eco-point: 2,7

Shiba Park

The park is a built like a circle surrounding the Zojo Temple and a hotel with its private garden. The garden and park has no visible border more than that it changes in design. Most of the park is smaller grasslands with single standing trees. One bigger area has a lawn and some flowerbeds, and a denser forested area with very steep steps and a viewpoint on top. It leads down to a more calm area designed with flowering trees and meandering paths that are also popular for cherry blossom picnic. The north side of the park circle is very close to Tokyo Tower and has a 10 meter waterfall surrounded by Japanese maple trees, which will be very beautiful in autumn. Due to the slim narrow frame design, it is very noisy everywhere.

Average eco-point: 1,8

Hinokicho Park

The park has a beautiful view over the pond and a resting house (open 05:00 – 22:30). There is a big lawn with some artificial grassed hills and a modern playing equipment, that is popular with kids. The lawn is not big but the space there is is packed with people and their picnic under the blossoms. There is quite modern/non-traditional playing equipment in the park. This is the only park in this analysis that closes at night.

Average eco-point: 1,7

Yoyogi Park & Meiji Jingu forest

Yoyogi Park is one of the largest parks in Tokyo. But combined with Meiji Jingu forest, it is the second largest (after the Imperial Palace garden) vegetated area within the 23 wards. Since the park and the forest has no physical border that divides them, I combined them in this analysis since it is what the nature within it has done.

Yoyogi Park is one of the largest parks in Tokyo, and definitely one of the most popular ones. The big lawns, the thick forest and the relaxed atmosphere lures people from all over Tokyo to this area. During hanami season this area is totally jammed with people and their picnic blankets, loud music and happy voices. The park has a pond with 3 fountains that spray up to 30 meters and light up in the evening, alongside with a boarded bridge with benches by the water. There is also a bird sanctuary, a separate cycle path that runs thorough the park, a large dog park with trees and obstacles, a smaller themed flower garden. The huge forest that combines Yoyogi and Meiji Jingu is originally a temple garden dedicated to the Emperor Meiji. It was originally designed with 100 000 trees, all planted by hand. Now it has grown even more, and has a very important role in biodiversity and its biological values in the otherwise very hardened city of Tokyo.

A very good location (close to popular shopping areas) might be the biggest reason for this popularity.

Average eco-point: 4,1

Ueno Park

One large part of the park is the oval Shinobazu Pond (不 忍 池) of almost 11 ha and measures 470 meter by the length. It's famous for the lotus flowers that will cover almost the whole pond in summer. The park has more open squares and museums than nature areas, and is very popular among the citizens. Especially for the big old cherry blossom trees.

Peony garden, a Zoo with a panda, museums, Temples and food trucks are some of the attractions found here.

Average eco-point: 1,9

Mizumoto Park

This is the biggest park in Tokyo. A calm and peaceful large park area. The park has a lot of water, with ponds, streams, canals, swamps and a waterfall. It seems very good for creating different habitats for flora and fauna. Around the streams grow thick vegetation of singular species only, such as a Metasequoia, Katsura, Alder, Swamp cypress or Poplars. And inside the pond and stream grow many kinds of Water-lilies and Lotus plants. The thick forests and and the big lawns make this a popular spot for sports and playing. The park has a BBQ section where you can buy supplies in a kiosk, and an camping area. Even though the pond is big, it is very calm and quiet and does not allow rowing boats etc. The people who come here merely look at and admire the power of nature. Wetland board walks, natural flowerbeds, tree information signs and flowerbeds in boats is other features in this park.

There is also a theater scene on a plaza, an amphitheater close to the lawn, a BBQ shop for spontaneous park visitors, food trucks/kiosks. The area is also an emergency evacuation area.

Average eco-point: 4,2

The data

All parks put together got an average grade of 3,0 eco-points. The median of all parks average eco-points are 2,7. Both scores are a little above half of the full scale. *Illustration 7* shows that 4 parks got a score of 4,0 or higher. They are Shakuji (4,2), Mizumoto (4,2), Yoyogi (4,1) and Hikarigaoka (4,0). No park scored full eco-points (5,0). 4 parks were below 2,0 eco-points. They are Hinokicho (1,7), Shiba (1,8), Wadabori (1,8) and Ueno (1,9).

Illustration 8.1 shows the average points divided into the different questions in the Questionnaire. (Only question 1-12 got a grading, 13-16 are explained in text. The full Questionnaire can be found in the Appendix). It shows that the questions regarding recreations (nr 11) got a full score (5,0) in all the parks. The questions regarding dead wood left on the ground got 1,7 average eco-points, and the question about the food possibilities got 1,1 eco-points. Those are both under 2,0 and the lowest scores among all of the questions.

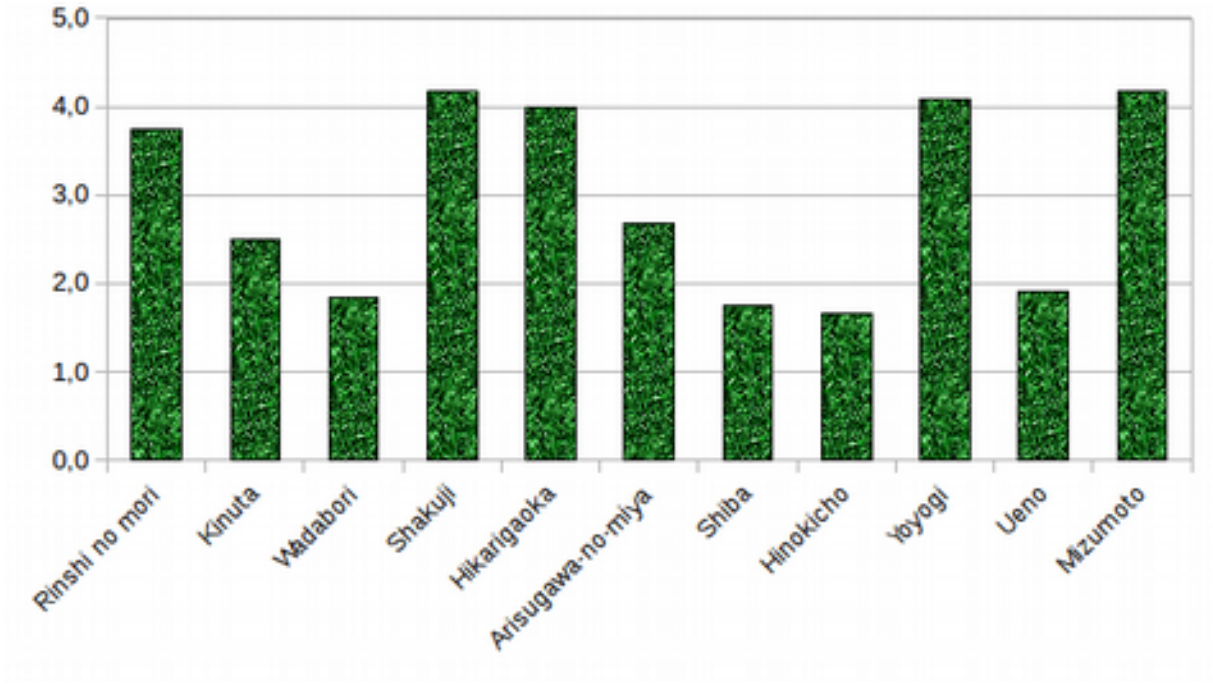


Illustration 6: All the average eco-points for each park

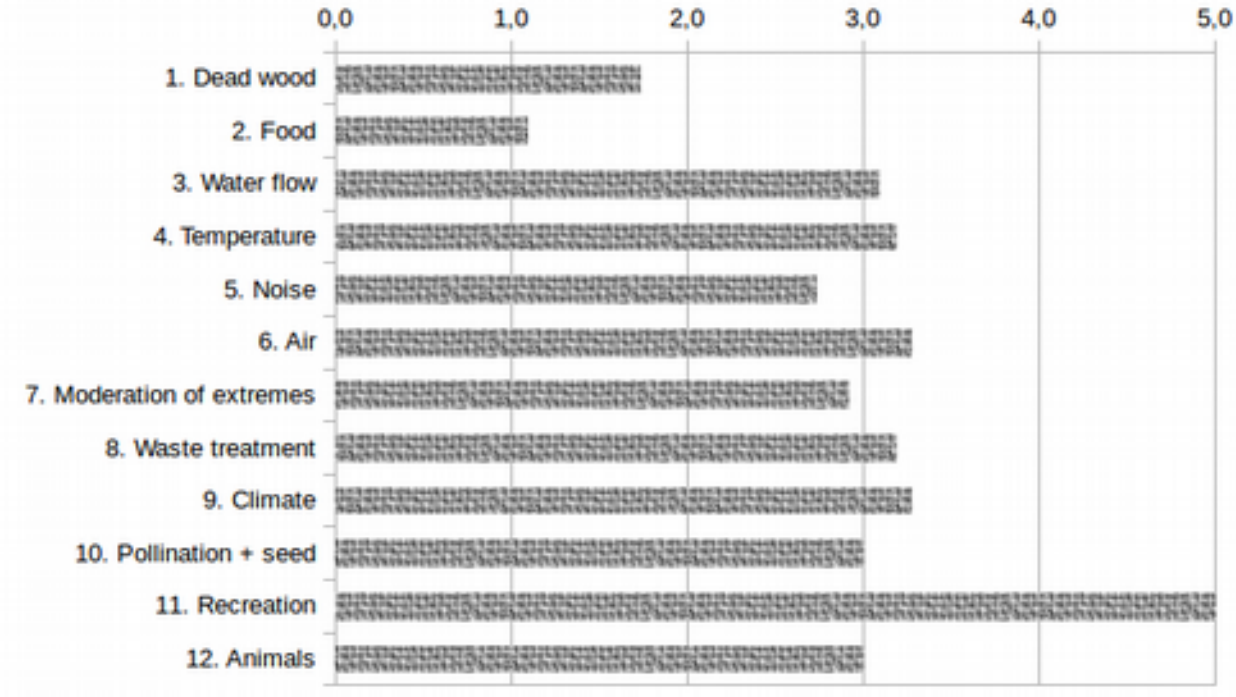


Illustration 7: All the average eco-points for each question

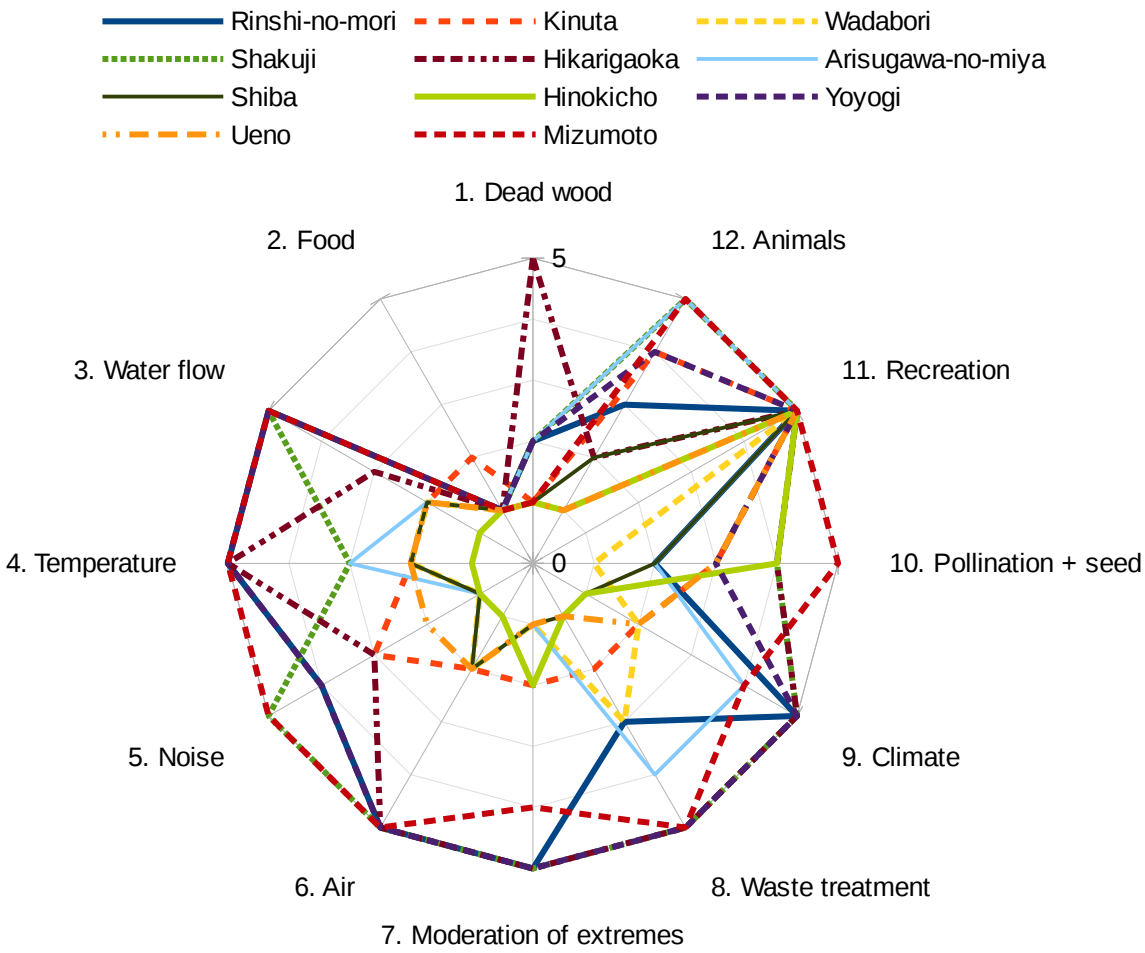
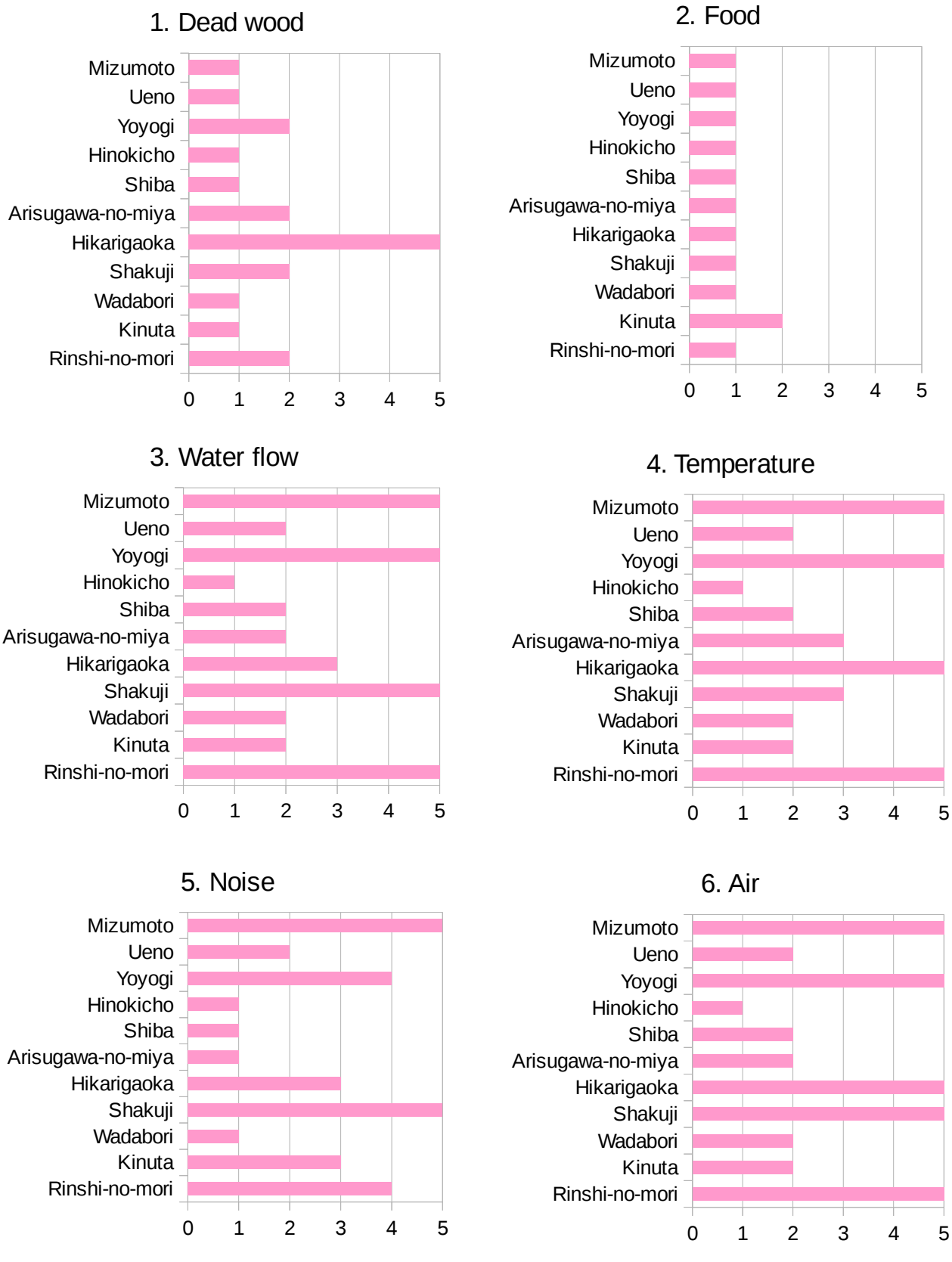
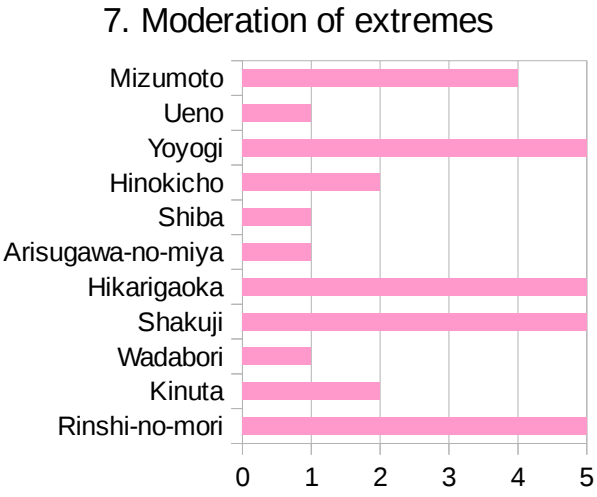


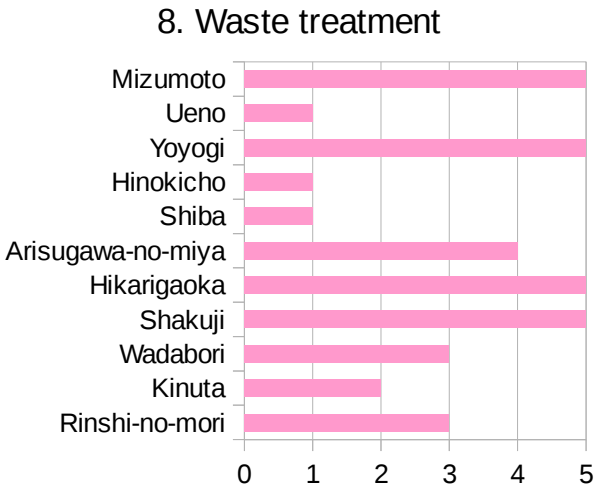
Illustration 8.1: All the eco-points for each question and park

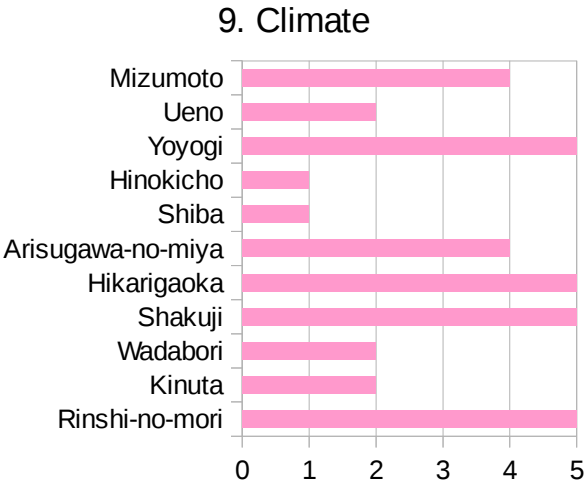
Note: Illustration 8.1-8.3 all shows the same original data but set up in different orders.

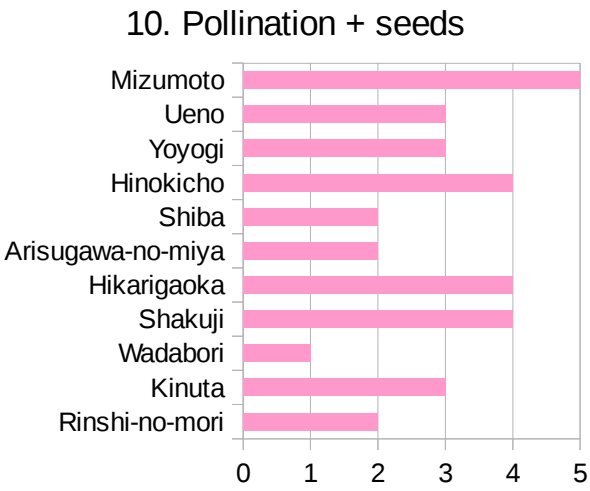
Illustration 8.2: Ecosystem service charts. All the eco-points separated to each question.

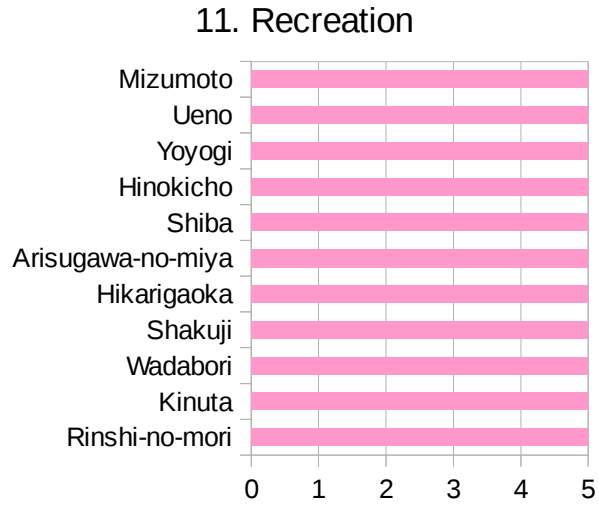



7. Moderation of extremes
Mizumoto
Ueno
Yoyogi
Hinokicho
Shiba
Arisugawa-no-miya
Hikarigaoka
Shakuji
Wadabori
Kinuta
Rinshi-no-mori
0 1 2 3 4 5


8. Waste treatment
Mizumoto
Ueno
Yoyogi
Hinokicho
Shiba
Arisugawa-no-miya
Hikarigaoka
Shakuji
Wadabori
Kinuta
Rinshi-no-mori
0 1 2 3 4 5


9. Climate
Mizumoto
Ueno
Yoyogi
Hinokicho
Shiba
Arisugawa-no-miya
Hikarigaoka
Shakuji
Wadabori
Kinuta
Rinshi-no-mori
0 1 2 3 4 5


10. Pollination + seeds
Mizumoto
Ueno
Yoyogi
Hinokicho
Shiba
Arisugawa-no-miya
Hikarigaoka
Shakuji
Wadabori
Kinuta
Rinshi-no-mori
0 1 2 3 4 5


11. Recreation
Mizumoto
Ueno
Yoyogi
Hinokicho
Shiba
Arisugawa-no-miya
Hikarigaoka
Shakuji
Wadabori
Kinuta
Rinshi-no-mori
0 1 2 3 4 5

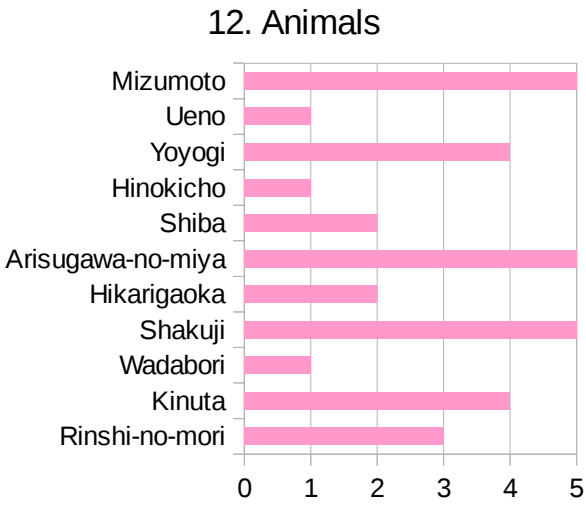
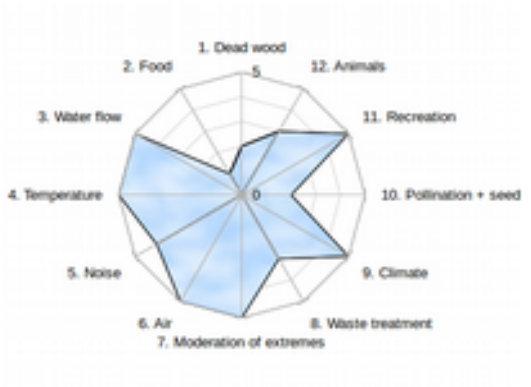
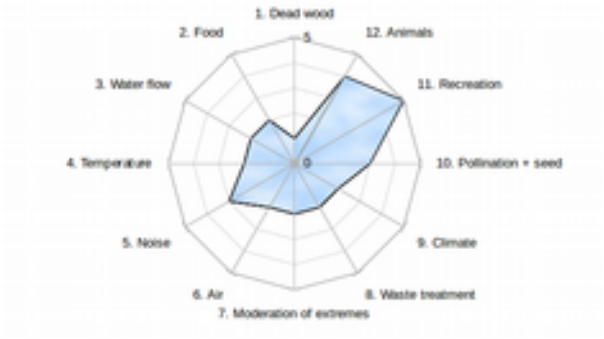

12. Animals
Mizumoto
Ueno
Yoyogi
Hinokicho
Shiba
Arisugawa-no-miya
Hikarigaoka
Shakuji
Wadabori
Kinuta
Rinshi-no-mori
0 1 2 3 4 5

Illustration 8.3: Eco-points charts

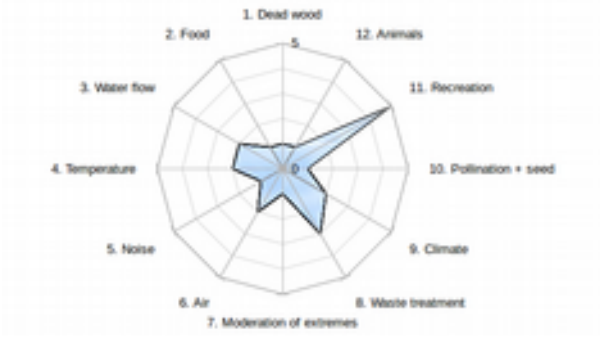
Rinshi no mori Park



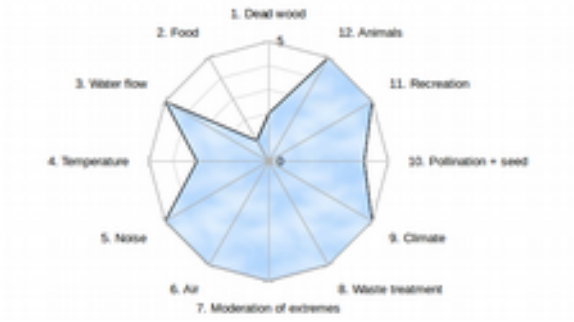
Kinuta Park



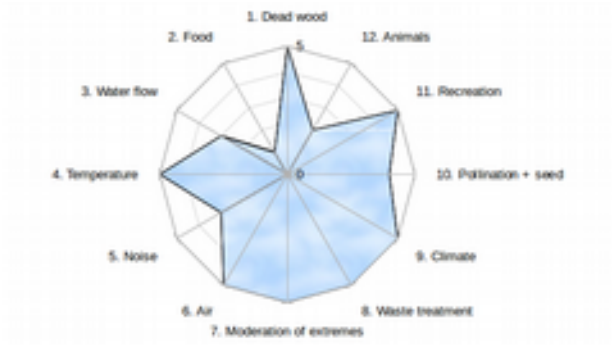
Wadabori Park



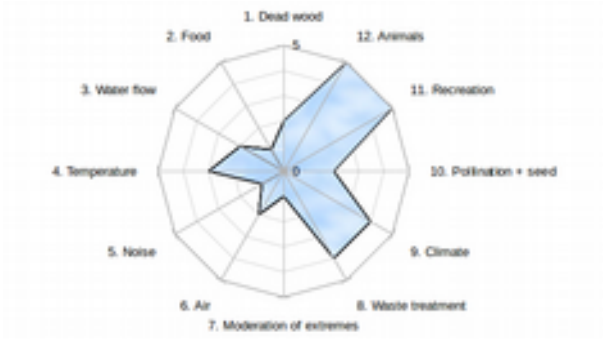
Shakuji Park



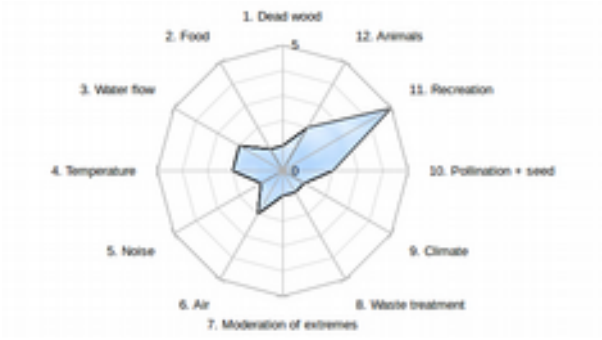
Hikarigaoka Park



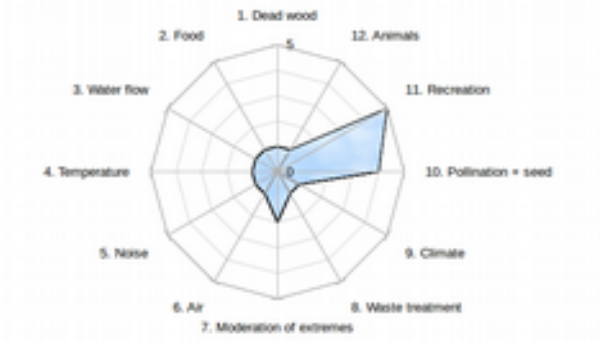
Arisugawa no miya Memorial Park



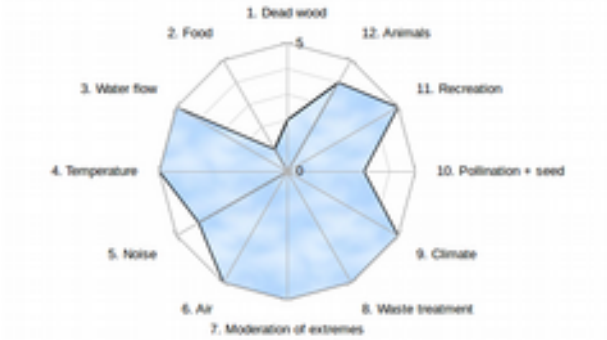
Shiba Park



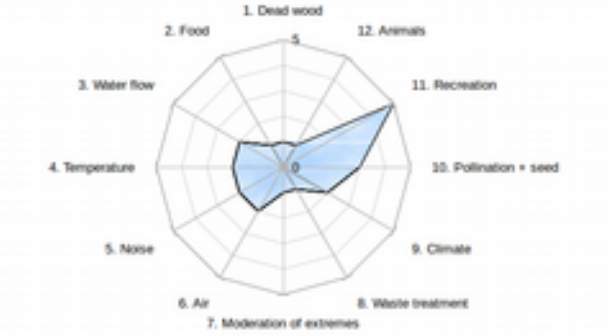
Hinikicho Park



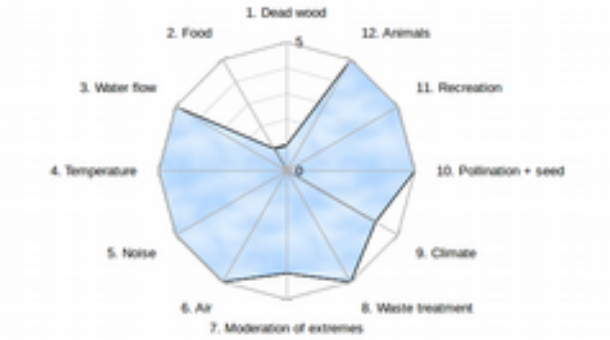
Yoyogi Park



Ueno Park



Mizumoto Park



Discussion

The data for the charts in *Illustration 6 - 8.3* is gathered through the ecosystem service specific Questionnaire, made in this thesis. 11 parks all over Tokyo are visited and analyzed through the same questions and grading. There are 16 questions, 12 of them are graded on a scale from 1 – 5 eco-points where 5 is the highest. The graded questions concern dead wood left on the ground, food possibility, water flow, temperature regulation, noise regulation, air regulation, extreme-weather moderation, waste treatment, climate regulation, pollination, recreation and animal presence.

The full summary of all the parks and the all the Questionnaires can be found in the Appendix.

As seen in *Illustration 7: All the average eco-points for each question,* almost every ecosystem question gets around 3 eco-points when put together. It means that there is a diversity among usage areas. Although it would be best for us humans if all parks scored 5 ep, because that means the parks are in line with the nature and we can benefit from it most.

Only the question about recreation at the parks got 5,0 eco-points. That means that all parks in Tokyo (that are investigated) are suitable for recreational activities. On the other hand, since all traditional Japanese gardens/parks are excluded from this survey, that leaves parks with high recreational value.

The question about food possibilities and dead wood on the ground got the lowest scores. These are not connected but somehow speaks of how the government (TMG) think the citizens considers the usage of the parks. They are supposed to be only for beauty, and both rotten fruits and logs on the ground make it look "dirty".

Illustration 6: All the average eco-points for each park shows the averages of all the parks eco-points. However it does hide some valuable information, for example, if one of the questions got a really low or a really high score, and which one of them. In the chart it shows that the best parks are Rinshi-no-mori Park, Shakuji Park, Hikarigaoka Park, Yoyogi Park and Mizumoto Park. These have in common that they are all big parks with big forested areas and they got high scores on the questions regarding and connected with the LAI and the recreation. The question 4 (temperature), 5 (air), 6 (noise) and 9 (climate) are partly connected because they concern the LAI (leaf area index, the mass of the leaves/unit) and with denser vegetation and a more multi layered forest type, there are more leaves. Thus giving more protection against the wind, noise etc.

It is noticeable that all parks with the lowest average grade (shown in *Illustration 6;* Wadabori, Shiba, Hinokicho, Ueno) on the contrary got highest score on the recreation question. The parks in general might not have good ecosystem services, but the importance of the recreating possibilities is always present. On the other side of the average points chart are the parks that got the highest scores (shown in *Illustration 6;* Rinshi-no-mori, Shakuji, Hikarigaoka, Yoyogi and Mizumoto) and they all have in common that they are the bigger ones.

The parks can all be divided in these two groups; the bigger parks with high scores except in logs and food concerns, and the smaller ones with low total average grade but with higher grades on the recreation. There is only one exception: Ueno park, which is one of the bigger ones, but it has a very low average grade. The Ueno Park is more like an amusement park with a lot of museums and a zoo, the roads are fully paved, there are big plazas and not so much forest. This is the reason that the park got low grade. The thicker the forest, the more LAI, and the higher eco-points it would gain. Ueno park is very popular among the citizens, but not so valuable from an ecological point of view.

When looking at *Illustration 8.1: All the eco-points for each question and park* it shows all the points for all parks, and for each question. This is the most informative graph, but also one that is hard to read. What the chart tells us is that all of parks in the analyses got a low grade on the question 1 and 2, regarding Dead wood and Food. The lack of dead wood is important for the preservation of a complete cycle in the forest and the sustainability of the biodiversity (Dahlberg A & Stokland J N, 2004). And the food in parks is a new trend from New York that is growing and becoming more popular these days (Cockrall-King J, 2012).

The use of dead wood is noticeably small in all the parks (see *Illustration 8.2:* "1. Dead wood"). Only one park really embraced the importance of dead wood in the urban parks, and that is Hikarigaoka park. The same park that saved an area for dandelions, and that had a fence around some part of the forest. The lack of dead and nearly dead wood in forests is a problem today. A high amount of dead wood is necessary to keep a balanced biodiversity in our forests. About 6 - 7 000 species are depending on the dead wood for their survival, and almost half of them are missing in ecological information. It is especially important for bugs, mosses, birds and mammals (Dahlberg A & Stokland J N, 2004).

Food is a resource we can not live without. The idea of growing food in our urban areas has started and spread throughout in the world today, with examples from London, Paris, Vancouver and New York. A study in New York shows the idea to bring food closer to the ones that need it, the people. And most of the people live is cities today. So that's why urban farming is the new future ideal of farming. This trend is growing over the world and might be the new way of locally grown food for the future citizens (Cockrall-King J, 2012).

When looking at the parks in Tokyo and how they are maintained, it gives a sign of careful cleaning of leaves and branches, and always short cut lawns. The bushes

are always fresh with new buds, and no dead parts of branches or dead flowers. In studies from Paris is has been proved that low maintenance areas in parks, by other words, longer cut grasslands, branches and leaves left on the ground, dead parts left on the ground, gave the biodiversity a boost with more birds, pollinating bugs (Shwarts A, 2013) and more species in the grasslands as a result (Politi Bertoncini A, 2012). The number of species increased if they got cut more seldom, and peace from trampling by visitors by, for example, fencing some areas. Another contributing factor that gets forgotten when applying high maintenance in the parks, is that the natural regeneration is stopped (Hedblom M & Söderström B, 2008) when cutting closely into the stem on bushes and trees, and mowing the lawns. That means that the way of maintaining the parks in Tokyo, with high maintenance, leads to a lesser species diversity than a park with low maintenance.

Birds are the most common animal species family in the parks, but to use birds species as proof of a well functioning biotope, can be considered both right and wrong. Right, because birds travel fast and easy from place to place - because they can fly. This is a proof that the place they chose is a good one (since they chose to land here) and if they stay here it means that there is food in the ground/on the trees/in the water and that the environment feels safe and natural. But it is a wrong proof because of the same reasons, the birds may have chosen the place temporarily and will not chose this place as a living habitat but more as a shabby and quick lunch place. Studies from urban areas show that animals and insects are almost always affected negatively by the urbanization. The amount of species diversity is rapidly decreased when comparing an urban area to the nature outside. On the other hand the amount of species that have lower demand for a certain living habitat is more common in urban areas (Grimm N-B, 2008).

An example of combining ecosystem services with the urban spaces can be found in Portland, Oregon, USA. The aim is to make the streets and the infrastructure "multi-function". That means, for example, that a street is used as a route of transport, but also storm water management, natural vegetation for the biodiversity and a better local climate (Ahern J, 2013). Tokyo could apply this theory of multifunction usage of the parks as well.

To make the park more close to the nature and upgrade the biodiversity there is some easy changes that can be made. One example is to make some of the lawns into lower maintenance lawns, and transform them into different type of meadows. This would save money by not cutting the lawn so often, but also benefit the biodiversity by allowing species to spread into the meadow, and allow it to flower to welcome insects and underground animals (Prach K, et al, 2013). Another way is to open up the ponds to be more like wetlands. By removing the hardened solid edges on the ponds and making the water more closer to the soil, shallow and moist on the edges, it would give more habitats to water plants and amphibians species. A third way is to create more edge zones to the forested areas witch would open up for more semi shadow species and wildlife who seek the low shade for hiding. The regeneration would become faster if there were edged zones in the forested area (Wiström B & Neilsen A B, 2014).

The parks all have one thing in common; the importance of the recreation (seen in *Illustration 6*). This shows in how the parks are planned. For example, there is always an area with cherry trees. The Hanami picnic is a more than popular activity in the beginning of spring in late march/early April. The picnic's main purpose is to watch the newly out sprung cherry blossoms (Hanami; hana = flower, mi = to see). While doing so you think of the new year and the times that are ahead. The 1st of April is the start of the fiscal year in Japan. That is when all the schools start, the companies restart their budget years etc. Spring means a fresh start. So this Hanami picnic is a big thing. A park without cherry trees are not chosen for this event. So the cherry trees area is an important factor in the design of the park. Then, whether the park has grass, bare ground, or is paved under the trees does not matter as much. The citizens will sit under the trees, no matter the flooring.

Another similarity is the water. There almost always some kind of pond, lake, or water puddle in the park. The water is also an important factor in the park, and the origin of this comes from the traditional Japanese gardens where the mirror reflection on a pond, the sound of pouring water in a stream, or the sound of the bamboo drain that captures water. If there is a bigger pond, there is most certainly a bunch of Koi (Japanese gold fish) in it as well. These also are an important factor, as they have the saying that they bring luck and strong healthy children.

The big forests in some of the parks are the most valuable source for the ecosystem services. The bigger, the better. On the other hand it is hard for the citizens to use this part of the park actively due to the dense vegetation and the difficultly to move around. There is a balance between these factors that needs to be considered when planning new park areas.

The parks of Tokyo are very valuable to the ecological system. There is not a perfect combined park yet, that fully uses the ecosystem services in the most efficient way, but it is on a good average level. There are some other ways to make them better at this. For example, to make lawns into meadows, connect the water with the vegetation, leaving logs for the sake of the biodiversity etc.

To use vegetation as a regulator for cleaning the air, temperature moderation, weather avoidance, noise regulation and adding recreational values to an area has proven to be very effective (Bolund & Hunhammar, 1999. Thorsson S, Honjo T et al, 2007). The ecosystems are all connected to each other in a way. So by choosing to apply one ecosystem service to a certain area, there is always other factors that will follow as a connection to one other ecosystem. So by adding an ecosystem service to a park, you will usually get more than one (Persson & Smith, 2014).

A side point to the discussion about adding biodiversity to urban areas is that uncut lawns, left branches, and other nature-like wilderness, might be seen as unmaintained and dirty by the citizens (Bolund & Hunhammar, 1999). It is important to work on a balance between benefiting the nature and what is regarded as beautiful. Who knows, in the future it might be seen as beautiful to care for the environment and our future preservation of our planet's living inhabitants - both human and nature.

Japanese parks are mostly created for the beauty, and not as much for the biodiversity. The park department of Tokyo Government is not interested in planing parks for the sake of the nature, or for future sustainability - if they are not forced.

Very seldom will they take advice from the citizens or listen to students, that come with new ideas collected from other countries. This will cause Tokyo a big set-back in the efforts of making a global change for the preservation of our present climate, since of all foot-prints left by big cities Tokyo leaves a big one.

This method has potential for development with more and wider research in the subject. There might be different results if the Questionnaire was done with another base for the questions, or by another person with another academic background than mine.

All analyzes are made with the research and facts that I have found on the subject on ecosystem service. The Questionnaire is made by my own knowledge and the research that I have found, and I believe another person might not find the exact same result as I have. Some or many results and the conclusions are based on the facts I have drawn out of this. Due to lack of time and in the frame of a masters thesis it is not possible to dig further into the different subjects in this major.

CONCLUSIONS

- *What kind of ecosystem services does the selected parks of Tokyo provide?*

The parks all provide the ecosystem service of dead wood, food, water flow, temperature regulation, air regulation, noise regulation, moderation of extreme-weather, waste treatment, climate regulation, pollination and seed dispersal, recreation and the presence of animals. The amount of the ecosystem services however are different among the parks.

No park reached full score on all of the eco-points. The parks that got the highest eco-points are all big parks with big forested areas, and that makes them a great benefit for the ecological values. The parks with the lowest grades are all smaller or more narrow parks with thinner forests.

An example is the trees. Trees regulates the temperature. On sunny days it gives shade and lower temperature, and in cold days it gives protection from blizzards and makes the temperature warmer. The trees in the forests also catch the wind and the noise from surroundings.

The ecosystems are all connected to each other in a way. So by choosing to apply one ecosystem service to a certain area, there is always other factors that will follow as a connection to one other ecosystem. So by having only one ecosystem service in a park, you will usually end up with more than one in the end.

- *What are the differences between the ecosystem services that the selected parks of Tokyo provide? Are there a connection between the differences?*

To see the connection, the parks can simply be divided into these two groups.

1. The bigger parks which got high scores, except in logs and food concerns
2. The smaller ones which got low total average score, but with higher grades on the recreation part

Most of the bigger parks have a large area left as enclosed forested areas. This benefits some of the fragile herb species and newly grown sprouts that are sensitive to trampling. The bigger parks are very valuable for the city's ecosystem. With thicker forest, that means more trees which gives more LAI, and the higher eco-points it will gain.

The parks all have one thing in common the importance of the recreation. This shows in how the parks are planned. For example, there is always an area with cherry trees. Another similarity is the water. There almost always some kind of pond, lake, or water puddle in the park.

The big forests in some of the parks are the most valuable source for the ecosystem services. The bigger, the better. On the other hand it is hard for the citizens to use this part of the park actively due to the dense vegetation and the difficultly to move around. There is a balance between these factors that needs to be considered.

The parks and the greenery of Tokyo are all of course very valuable to the ecological system in a way. There is not a perfect combined park yet, that fully

uses the ecosystem services in the most efficient way, but it is on a good average level. There are some other ways to make them better at this. For example, to make lawns into meadows, connect the water with the vegetation, leaving logs for the sake of the biodiversity etc.

Further research

For a deeper analysis of the ecosystem services of Japanese parks it would be interesting to add the water usage and distribution, species diversity in urban forests and in solitary trees/bushes, etc. The Questionnaire can be made in a co-operation with other researchers. Another deeper analysis would be to research even more parks in Tokyo, and in other cities in Japan. It would then be interesting to make a comparison to the parks in Sweden.

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Appendix

The Ecosystem Service Questionnaires

Rinshi-no-mori, Meguro ward

Kinuta Park, Setagaya ward

Wadabori Park, Suginami ward

Shakuji Park, Nerima ward

Hikarigaoka Park, Nerima ward

Arisugawa-no-miya Memorial Park, Minato ward

Shiba Park, Minato ward

Hinokicho Park, Minato ward

Yoyogi Park & Meiji Jingu forest, Shibuya ward

Ueno Park, Taito ward

Mizumoto Park, Katsushika ward

Interviews

1 - Ichihashi, Arata: Tokyo Metropolitan Government. 2017-02-09

2 - Kinoshita, Isami: Chiba University. 2017-04-17

RINSHI-NO-MORI PARK
林試の森公園

Illustration 9: Map of Rinshi-no-mori Park

Date & time of visit: 2017-04-03, 11:00
Visitor rating from map site: 4,3 p.
Average eco-point: 3,8 ep.
Access: Free, open all day. Closest subway/train stop: Musashi-koyama station, 2 stops from Meguro on the JR Yamanote-line. Less than a 10 minutes walk from the station to the park.
Size: 12,3 ha
Founded: 1989
Tagline from Tokyo Park Department: “Deep forest left in central Tokyo”
History: The area was originally an experimental nursery from 1900-1978 under the name of Forestry Research Station. When the station was moved to Tsukuba it opened as an public park in 1989 and got the name Rinshi no mori (translated as ‘wood of the test forest’). The park is left with the unique value of 100-year old trees is many different species. (Tokyo Metropolitan Park Association, 2017)

Impression: The park is very popular and lively. The park is easily divided in a lively sports area, a family area by the playing equipment, and a calmer woody area. The pillar hall structure in one part gives an open and lively atmosphere, and the multi-layered woody area gives a more slow and quieter area. Special features is the amphitheater, a disaster toilet location, good cherry blossom spots and a splash pond for the warmest months.

QUESTIONNAIRE

1. Are there logs that can be used, or dead wood left on the ground?

At one place there was a fallen tree, protected inside a fence. This tree had a sign sayng that it fell in a typhoon September 2011. It was a Eucalyptus tree that reached 34 meters, and had a circumference of 329 cm. No traces of other dead wood on the ground more than smaller twigs that got hidden under the floor vegetation.

2 ep.

2. Are there food possibilities?

No, no food possibilities.

1 ep.

3. Is there vegetation that can help with water flow regulation and runoff mitigation?

Very good. A lot of open surfaces covered with vegetation. Paved roads will make the water travel on top of them towards the planting areas. At the busy sports area, most surface under the trees was intensely compacted. At some parts the roots got protected by surface protection net underneath the trees by the playing equipment.

By the wooded area there are fences to protect the floor vegetation from trampling. At these areas the soil was loose.

5 ep.

4. Is the park contributing to a temperature regulation?

The parks western side has a lot of single standing trees which gives a lot of shade. Most trees are deciduous but the density makes it good even when the leaves hasn't sprung yet. At the east side the park change character to a more woody park type. The paths get more narrow and the vegetation is more freely growing, the floor get a flora cover. This area has more conifers which makes the temperature cooler. Trees give thick shadows.

5 ep.

5. Is the park contributing to a noise regulation?

No specific vegetation barrier, but many dense trees makes the traffic noise light, even though the road is quite close.

4 ep.

6. Is the park contributing to air purification?

Yes, a lot of vegetation to capture particles.

5 ep.

7. Is the park contributing to moderation of environmental extremes?

Floods: A smaller amphitheatre in the middle of the park will in case of heavy rain collect a lot of water. The surface of the theatre is of grass, so if the soil is not to compact it will eventually soak into the ground. A pond is located in the middle, and from it leads a stream. This will not collect a lot of water because the sides are not so steep and the stream is very shallow. The park is a bit sloping from west to east which will make the run-off travel towards the road in the east.

However, in the very east area of the park there are 6 wells that all lead to a bigger underground water storage. It is a heavy rain caption experiment. Most of the rain usually go to the river, but in case of very heavy rain the well in the ground can hold some of the water and then let it slowly sink into the ground.

No strong wind is noticed, but the park might be protected from the building nearby.

5 ep.

8. Is the park contributing to waste treatment?

No left leaves under bushes or on the grass. The eastern more woody area has more dense floor flora and leaves are kept/forgotten in this area under the springing herbs and bamboo.

3 ep.

9. Is the park contributing to climate regulation?

Yes, a lot of vegetation biomass.

5 ep.

10. Is the park contributing to pollination and seed dispersal?

A few spring flowers, and many blooming cherry blossoms. Some blooming bushes.

2 ep.

11. Is the park contributing to recreation and cognitive development?

Yes, a lot of different recreation and cognitive development possibilities

5 ep.

12. What kind of animal sighting/signs can be found?

No insects visible. Bird song heard from the trees and pigeons and Japanese crows visible. Many turtles and some carps in the pond.

3 ep.

13. Is the park accessible for everyone?

Some, but very few stairs that can be avoided. Mostly flat surface and all paths are paved. A lot of benches for resting. No blind trails.

A lot of maps giving information about area, tree species, tree diversity, water storage protection, disaster toilet area. No signs for blind people.

14. What are the recreation possibilities in this park?

People were seen jogging, looking at turtles, playing by playing equipment, organized sports like baseball, gateball (ゲートボール), having picnic under the blossoms (hanami), taking a lunch break, walking with toddlers, parents meeting up with their children to play together, cyclists passing through, walking with dogs, senior stroll, parent with their baby strollers.

15. What is the atmosphere in the park?

The park is easily divided in a lively sports area, a family area by the playing equipment, and a calmer woody area. The pillar hall structure in one part gives an open and lively atmosphere, and the multi-layered woody area gives a more slow and quieter area.

16. Other special features in this park?

Solar charged lamps on some spots. Sign boards of trees makes the landscape education preserved, trees has signs on them with Japanese name. A paddling pool for toddlers (open july – august). Gravelled sports courts where at the moment soccer was played. Playground with bare ground and natural benches made of wood. Amphitheatre/ meeting place is the middle, a quiet spot where event can be held.

Disaster event toilets can be put up in this park. 10 + 15 ground sewage ready to get installed in separate areas in case of an evacuation is necessary, then the toilets will be useful.

Heavy rain caption experiment. Most of the rain usually go to the river, but in case of very heavy rain the well in the ground can hold some of the water and then let it slowly sink into the ground.

Illustration 10: The sports yard and a sign about butterflies

Illustration 11: Signs explaining flora and fauna found in the park

Illustration 12: A fenced dead tree and a sign explaining the reason it fell

Illustration 13: The wilder floor vegetation and solitary trees

Illustration 14: Turtles and carps in the pond

Illustration 15: Flooding protection underneath the park

KINUTA PARK
砧公園

Illustration 16: Map of Kinuta Park

Date & time of visit: 2017-04-03, 14:00
Access: Free, open all day.
Closest subway/train stop: Yoga, 5 stops from Shibuya with Tokyu-den-entoshi line, and then a 20 min walk.
Size: 39,2 ha
Founded: 1957
Visitor rating from map site: 4,3 p.
Average eco-point: 2,5 ep.

Tagline from Tokyo Park Department: “Children’s happy voices echo in the wind”

History: From a large wood that worked as a commemorative projects in 1935 for 2,600th anniversary of National Foundation, it became a public park in 1957. The lawn was by that time used as golfing courses but today it is open for plain free use. (Tokyo Metropolitan Park Association, 2017)

Impression: A very popular park, a bit far from the city centre. The most attractive spots are the big lawns for sports and big lawn for calmer activities and cherry blossom picnic. The park holds a bird sanctuary where many different species of birds travel to.

QUESTIONNAIRE

1. Are there logs that can be used, or dead wood left on the ground?

No. One corner had branches piled up, but they would certainly soon be removed by maintenance personal.

1 ep.

2. Are there food possibilities?

A few *Prunus padus* (Bird cherry) trees found. These give fruit.

2 ep.

3. Is there vegetation that can help with water flow regulation and runoff mitigation?

The is more open grassland, than vegetated, so no. The grassland is heavily used and the soil is very compacted which makes it hard for water to penetrate the surface.

2 ep.

4. Is the park contributing to a temperature regulation?

Partly. Some vegetated areas, but mostly single standing trees. The wooded areas holds both conifers and deciduous species.

2 ep.

5. Is the park contributing to a noise regulation?

Some noise escapes into the park from the big road nearby. There is no special border to prevent sound from travelling into the area.

3 ep.

6. Is the park contributing to air purification?

Yes. But just a few vegetated areas.

2 ep.

7. Is the park contributing to moderation of environmental extremes?

Due to the many open lawns the wind sometimes becomes very strong. No special flooding prevention. There is one stream that divides the park. It is deep with steep edges. A lot of water can easily take this route away from the area.

2 ep.

8. Is the park contributing to waste treatment?

Some more free growing parts of the vegetated areas are left with it’s natural compostation.

2 ep.

9. Is the park contributing to climate regulation?

Yes. But just a few vegetated areas.

2 ep.

10. Is the park contributing to pollination and seed dispersal?

There is a bird sanctuary in the park, where vegetation is allowed to spread freely. Outside of the sanctuary is a smaller flower bed area that was visited by butterflies and bees (to gather insects, for the birds to eat?) and some pots with violets. But all these are very limited and few.

3 ep.

11. Is the park contributing to recreation and cognitive development?

Yes. A lot of different possibilities.

5 ep.

12. What kind of animal sighting/signs can be found?

Many birds is the sanctuary, a heron got spotted. Smaller birds in trees can be heard. Crows and pigeons are visible on the fields.

4 ep.

13. Is the park accessible for everyone?

The surface is flat and the paths are paved, so accessing with wheels is easy. Although the park itself is very steep sometimes and those areas doesn't have special customized paths, there is no steps or stairways.

The entrance board had Braille text information on it and a map with raised lines.

14. What are the recreation possibilities in this park?

Many people where seen on the lawns having hanami picnic with their family or friends. Younger children and their guardians by playing equipment area. Big lawns for sports and big lawn for calmer activities like picnic. Many cherry blossom viewing spots. Performance area, at the moment a duo of xylophone players attracted a big crowd. Drums from afar could be heard. Kids with kites on the lawns. Frisbee play. Skipping rope play. Soap bubbles play. The bird sanctuary had many visitors with binoculars and bird text books. Joggers used the paths to run on. Dog owners used the woody are to walk in. A painer was seen. An old man with a toddler where putting up a hammock between two trees.

15. What is the atmosphere in the park?

Lively and active atmosphere.

16. Other special features in this park?

The bird sanctuary had a 2 meter high metal fence with no entrance possibilities. There was however a wooded fence with cut wholes in different heights, for viewing through. And a lot of signs explaining what types of bird can be seen here. A bicycle path ran through the west side of the park. Some solar charged lamp posts.

Illustration 17: Open spaces and paved paths

Illustration 18: The Bird Sanctuary, with peep-holes

Illustration 19: Pillar hall type structure and a hammock

Illustration 20: Flowerbeds

Illustration 21: A mix of deciduous and coniferous species

Illustration 22: Hanami on the lawns

WADABORI PARK
和田堀公園

Illustration 23: Map of Wadabori Park

Date & time of visit: 2017-04-03, 16:00
Access: Free, open all day. Closest subway/train stop: Eifukusho, 3 stops from Shibuya with Keio-Inokashira Line and then a 1 km walk to the park.
Size: 16,1 ha (authors calculation)
Founded: (no official year)
Visitor rating from map site: 4,4 p.
Average eco-point: 1,8 ep.

Tagline from Tokyo Park Department: “Wadabori Lake maintaining tranquillity surrounded by greenery”

History: The park lays alongside the river Zenpukuji which used to flood very often before. So at 1955 the river became artificial and completely covered in concrete. The bird Kingfishers has its habitat by this river still, which is rare in a city area. 12 bridges crosses the river in the park area. (Tokyo Metropolitan Park Association, 2017)

Impression: The park is calm and give an impression of being a local neighbourhood park. It is not so clean and the grass and bushes are unmaintained and grows high and freely. The feeling is that it is not prioritized by the maintenance organization.

QUESTIONNAIRE

1. Are there logs that can be used, or dead wood left on the ground?

No.

1 ep.

2. Are there food possibilities?

No.

1 ep.

3. Is there vegetation that can help with water flow regulation and runoff mitigation?

A lot of open spaces with either grass or bare soil, both very compacted and will be hard for water to get through. If the water travels to the riverbank it will easily flow down to it because there is no solid wall.

2 ep.

4. Is the park contributing to a temperature regulation?

Yes. The canopy is very dense at many places.

2 ep.

5. Is the park contributing to a noise regulation?

No. There is noise from the road, although the road is not so heavily trafficked.

1 ep.

6. Is the park contributing to air purification?

Yes. But just a few vegetated areas.

2 ep.

7. Is the park contributing to moderation of environmental extremes?

No. Most of the taller trees are set in a pillar hall environment, so the wind can travel freely.

1 ep.

8. Is the park contributing to waste treatment?

Leaves and branches are left on the ground (due to lack of maintenance). High grass and herbs gives signs on high nutritions in the ground.

3 ep.

9. Is the park contributing to climate regulation?

Yes. But just a few vegetated areas.

2 ep.

10. Is the park contributing to pollination and seed dispersal?

No visible herbaceous flower, some cherry trees and flowering bushes.

1 ep.

11. Is the park contributing to recreation and cognitive development?

Yes. A lot of different possibilities.

5 ep.

12. What kind of animal sighting/signs can be found?

A few birds are visible.

1 ep.

13. Is the park accessible for everyone?

Most part of the paths are bumpy and roots can make it difficult to walk. Some paths are paved, and there are no steps.

14. What are the recreation possibilities in this park?

A few people had hanami picnic. Kids were running and fighting with bamboo sticks (presumed to have been found in park). Slow stroll with toddlers. Jogging. Badminton duo. A pond inside a fenced area, for fishing.

15. What is the atmosphere in the park?

Calm in greenery.

16. Other special features in this park?

A fishing pond inside the park.

Illustration 24: The pond and the island (at the left side)

Illustration 25: The lawn used for play

Illustration 26: Somewhat unmaintained paths, and the pillar hall

Illustration 27: The cherries over the old river

SHAKUJI PARK
石神井公園

Illustration 28: Map of Shakuji Park

Date & time of visit: 2017-04-04, 14:00

Access: Free, open all day. Closest subway/train stop: Shakuji-koen, 9 mins on the Seibu-ikebukuro Line from Ikebukuro. And less than 10 minute walk to the park.
Size: 22,6 ha
Founded: 1964
Visitor rating from map site: 4,3 p.
Average eco-point: 4,2 ep.

Tagline from Tokyo Park Department: “Sanpouji Pond full of nature”

History: There is a ruin of Shakuji castle from the 12-13th century left in the park. Among with other smaller shrines.

Impression: A big park which is partly a free growing yet maintained temple forest and two big ponds. A big pond with high biological value called Sanpoji pond protected by the forest and a boarded walking trail around it, and a resting hut in the middle. The other pond is called Shakuji pond and have a boat renting facility, which makes the area more lively. Inside the forest there is a bird sanctuary which is more popular for birds than humans. There is a nature inspired playground with wooden playing equipment, sandpit and swings and a lot of big and tall trees, for shadow and to be part of a play. One part is designed with a flower bed area, a bush area and a cherry blossom area.

QUESTIONNAIRE

1. Are there logs that can be used, or dead wood left on the ground?

A few twigs and leaves are left on the ground, but other than that the forest floor is very cleaned from leaves and twigs.

2 ep.

2. Are there food possibilities?

Officially no, but fishing occurred in the pond although it is forbidden.

1 ep.

3. Is there vegetation that can help with water flow regulation and run-off mitigation?

Yes very probable water flow regulation, thanks to the pond and thick forest.

5 ep.

4. Is the park contributing to a temperature regulation?

Medium shade possibilities. Pond is open, and there is open sports courts.

3 ep.

5. Is the park contributing to a noise regulation?

There is thick forest as a border around the pond, so the inside is very quiet. A road runs through in the middle, but even that one is not so noisy.

5 ep.

6. Is the park contributing to air purification?

Yes, the forest holds both deciduous species and conifers.

5 ep.

7. Is the park contributing to moderation of environmental extremes?

The wind is caught in the trees and if flooding would occur the pond can hold a lot of water since it is much lower than the rest of the park and forest.

5 ep.

8. Is the park contributing to waste treatment?

In the pond the reed is cut, but left. A lot of plants is neatly left to decay.

5 ep.

9. Is the park contributing to climate regulation?

Yes. A lot of vegetation biomass.

5 ep.

10. Is the park contributing to pollination and seed dispersal?

There is a flower bed area, and the pond has a lot of water perennials that will bloom and give nectar. One area has higher fence which keeps humans out of it, thus has a lot of herbs that will help pollination.

4 ep.

11. Is the park contributing to recreation and cognitive development?

Yes.

5 ep.

12. What kind of animal sighting/signs can be found?

A lot of birds was heard in the bird sanctuary. There were many water birds in the ponds. Japanese crow, and pigeon were seen on the grounds. Butterflies were found by the flower bed. Carps in the pond.

5 ep.

13. Is the park accessible for everyone?

The pond were mostly fenced and easy to walk along, without the risk of stumbling into the water. There was mostly flat ground, but sometimes steep. A few steps were found, but can be avoided.

14. What are the recreation possibilities in this park?

Most people were walking slowly around the pond and admiring the nature. Photographers and a painter were spotted as well. Children played with a landing net to catch tadpoles in a jar. A child and a grandparent gave food to the fish in the pond. Kids and guardians played by the playing equipment. A smaller spot with cherry trees was crowded with families having hanami picnic. A group of seniors was painting pictures of the cherry blossoms and magnolia trees. Parents walked among the flower beds with toddlers and showed them the butterflies. The bush garden was populated with smaller picnic parties that wanted more privacy, given by the many bushes that created smaller rooms. A person playing a Contrabass in the shadows of the wood. In the deep forest was a group of adventurous older children. Many people rented boats in the second pond and was seen laughing and playing. An open out-door theatre (staircase seats and a stage) gave seating for people in need for a rest or a view.

15. What is the atmosphere in the park?

Partly for play, partly for complementation.

16. Other special features in this park?

Many signs abound the pond explaining about birds and plants.

One really old tree had a sign explaining that this was the “Tree of the ward”.

The bird sanctuary is protected by a 2 meter high fence and can not be entered by humans.

There is a resting area with roof by the far side of the pond, with a very beautiful view.

Illustration 29: Pond with a lot of fauna

Illustration 30: Flowerbeds and flowering trees

Illustration 31: Pillard hall, and play area in the background

Illustration 32: The lively pond and some boats

Illustration 34: Flooding protection information

Illustration 33: Artists gathered by the water view

Illustration 35: The calm pond and the rest house

Illustration 36: Wetlands

HIKARIGAOKA PARK
光が丘公園

Illustration 37: Map of Hikarigaoka

Date & time of visit: 2017-04-04, 16:00

Access: Free, open all day. Closest subway/train stop: Hikarigaoka station, 24 minutes on the Oedo Line from Shinjuku, and then less than 5 minutes walk to the park.
Size: 60,8 ha
Founded: 1974
Visitor rating from map site: 4,3 p.
Average eco-point: 4,0 ep.

Tag-line from Tokyo Park Department: “Sports park full of nature”

History: In the time of WWII the area was part of an area used by the Japanese military air force, but after the war the USA took over it and used it as the Grand Heights instead. It was given back to the Japanese government in 1973 and one third of the old area became this park. (Tokyo Metropolitan Park Association, 2017)

Impression: The square at the entrance of the park is popular for skateboarders and street performance artists. The lawns are hilly and large. There are many Hanami spots to choose from, i.e. a grass lawn with low branches, or a more shadowy spot with older and taller trees. A playing area had more advanced playing equipment (e.g. looped swing track, climbing wall). There are many sports courts for many different sports. There is a fenced protected forest with a very long jogging trail around the whole park. And a bird sanctuary.

QUESTIONNAIRE

1. Are there logs that can be used, or dead wood left on the ground?

Yes. Some rotten and some fresher wood in the nature reserve area. A decay special boxed area.

5 ep.

2. Are there food possibilities?

No.

1 ep.

3. Is there vegetation that can help with water flow regulation and run-off mitigation?

One part is very vegetated, but most part is paved or open compacted lawns.

3 ep.

4. Is the park contributing to a temperature regulation?

Yes. There is lot of shade from single standing trees and more denser area in the forest.

5 ep.

5. Is the park contributing to a noise regulation?

Cars are audible in all area, but not too loud.

3 ep.

6. Is the park contributing to air purification?

Yes. A lot of vegetation to capture particles.

5 ep.

7. Is the park contributing to moderation of environmental extremes?

The park is partly an evacuation area, but just a gathering spot. The pond is not helpful in disaster events because it is fenced with a solid wall so water can’t run down to it from the square. The area is windy and not protected, even if there is a big forest inside. A water catching system is placed underneath the forest in one part of the park

5 ep.

8. Is the park contributing to waste treatment?

Yes, the wooded area is mostly left with low maintenance.

5 ep.

9. Is the park contributing to climate regulation?

Yes. A lot of vegetation biomass.

5 ep.

10. Is the park contributing to pollination and seed dispersal?

A lot of blooming cherry trees and some fenced herbs and spring blossoms. An area was saved only for the dandelions preservation.

4 ep.

11. Is the park contributing to recreation and cognitive development?

Yes.

5 ep.

12. What kind of animal sighting/signs can be found?

Birds in the bird sanctuary. Some water birds in the pond (but lesser than expected).

2 ep.

13. Is the park accessible for everyone?

All paths are flat.

14. What are the recreation possibilities in this park?

Cherry blossom picnic with family and friends. The square at the entrance of the park is popular for skateboarders and street performance artists. The lawns are used for playing with dogs, badminton, ball games, Frisbee etc. A BBQ-pit was found but not used (it was raining at that time). Sports courts was used for tennis players, soccer, basket ball, gate-ball (ゲートボール) and even a Japanese archery section. In the forest a saxophone player was practising. And on the fields one person played the saw. Many people where jogging in the forested parts. Some walked their dogs.

15. What is the atmosphere in the park?

Sporty and active, not even the forest has a calm feeling.

16. Other special features in this park?

The park is partly an evacuation lawn that can hold 200 000 people. Some lamp posts were charged by solar panels. A bird sanctuary with 2 meter high metal fence, on top of a 1 meter concrete wall decorated with metal barbs. One road into the park is full of cherry blossoms, and one is of only Ginko trees.

Illustration 38: The plaza with solitary trees

Illustration 39: Hanami under cherry trees

Illustration 41: Biotope saved for a Japanese dandelion that is only found in this area

Illustration 40: Jogging trail and the fenced forest

Illustration 43: Open spaces, lawn

Illustration 42: The pond, and part of the bird sanctuary

ARISUGAWA-NO-MIYA MEMORIAL PARK
有栖川宮記念公園

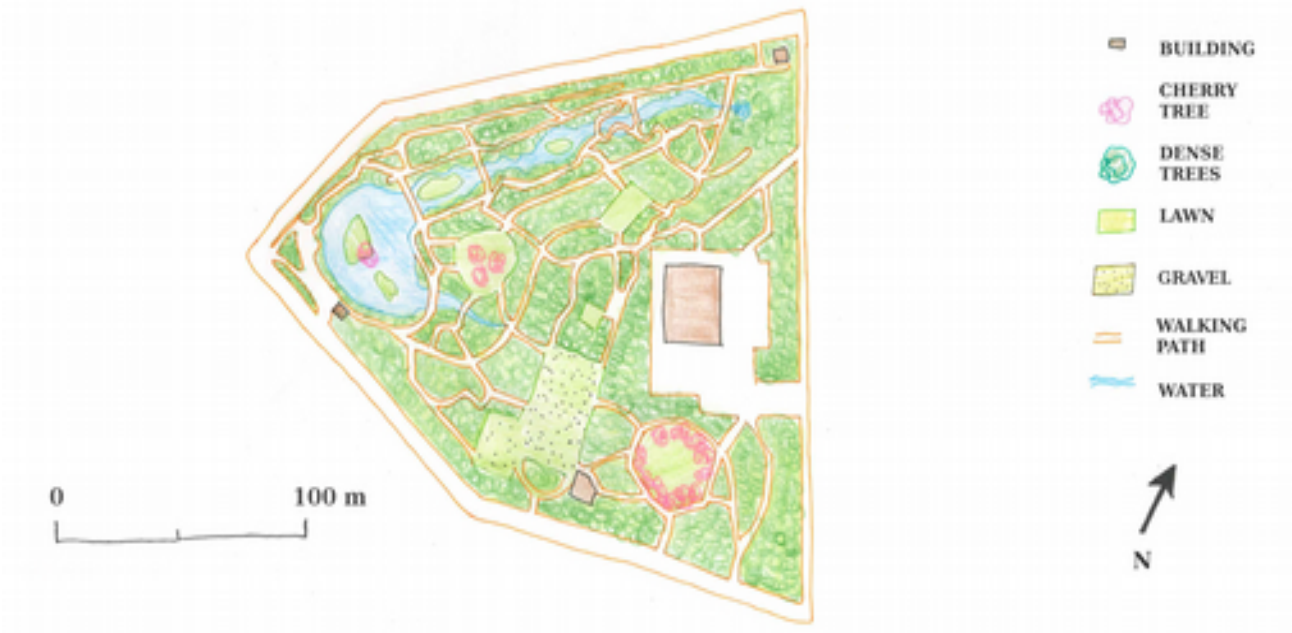

Illustration 44: Map of Arisugawa-no-miya

Date & time of visit: 2017-04-05, 12:00

Access: Free, open all day. Closest subway/train stop: Hiro-o, 1 stop from Roppongi on Hibiya Line, and then less than 5 minutes walk.
Size: 6,7 ha
Founded: 1934
Visitor rating from map site: 4,4 p.
Average eco-point: 2,7 ep.

History: Arisugawa-no-miya was one of the family houses in the Imperial Palace family of Japan that was founded in the early years of 1600. The area was used as the family villa until 1900's when it was passed down to the Prince Takamatsu. The prince had a great interest in the education of nature as a health improvement for children, so he donated the 3,6 ha land to Tokyo, to create a park. The park was combined with the sports fields and was officially opened 1934. (Azajuban-michi-annai, 2017)

Impression: A clean and green elevated oasis in the middle of the city. The big pond and the thick vegetation gives a peaceful feeling. Many people pass this park on their lunch-break or for a stroll with their children. Some fishing men can often be seen by the pond, but the fish are not for eating as they are put back into the water after they ere caught. Because of it's location close to a popular shopping street, a library and an embassy in the area, many foreigners and young people are seen

here in park. A rippling waterfall and a quiet steam leads to the pond, which has an small island full of flowering trees in the middle.

QUESTIONNAIRE

1. Are there logs that can be used, or dead wood left on the ground?

Stump from cut trees remain, and a few branches under thick bushes.

2 ep.

2. Are there food possibilities?

No. A pond with fish but, Fishing is forbidden.

1 ep.

3. Is there vegetation that can help with water flow regulation and run-off mitigation?

Thick vegetation, but very steep ground so it will not help with the water conservation. The pond can catch some water but the edges are not very high nor steep.

2 ep.

4. Is the park contributing to a temperature regulation?

Yes, partly. There are many single standing trees and open areas mixed with a part of denser vegetation.

3 ep.

5. Is the park contributing to a noise regulation?

No, the road next to it is audible all the time.

1 ep.

6. Is the park contributing to air purification?

Yes. But most of tree canopy are high up and wind just blows through.

2 ep.

7. Is the park contributing to moderation of environmental extremes?

The park is protected by the buildings surrounding it, so a mild moderation of the wind. No flooding precautions noticed.

1 ep.

8. Is the park contributing to waste treatment?

Mostly cleaned, but in the more woody parts some leaves and branches was found.

4 ep.

9. Is the park contributing to climate regulation?

Yes. Mostly vegetated.

4 ep.

10. Is the park contributing to pollination and seed dispersal?

A small amount of spring flowers and butterflies was found, but mostly bamboo and trees. Some cherry and plum blossoms.

2 ep.

11. Is the park contributing to recreation and cognitive development?

Yes.

5 ep.

12. What kind of animal sighting/signs can be found?

Turtles, carps and water birds in the pond. Pigeons.

5 ep.

13. Is the park accessible for everyone?

The entrance sign has Braille writing. Just the lower part in accessible with wheelchair, then the stairs begin.

14. What are the recreation possibilities in this park?

Social fishing people, young people drinking by the pond, children looking for tadpoles, working people on their lunch break, families feeding the fishes, kinder-garden class on stroll/to the playground, walking the dog, children running in the thick vegetation. The sports court was used for in-lines practice, baseball, basketball, teenagers practising dancing, younger kids watching the teenagers. A small grass field with cherry blossoms was full of people having a picnic.

15. What is the atmosphere in the park?

Loud and lively by the sports courts, calm tranquillity by the pond area.

16. Other special features in this park?

The park is used as an evacuation spot. Many signs are put up with information about cherry tree species, birds and nature.

Illustration 45: Turtles in the pond

Illustration 46: Hanami on a lawn

Illustration 47: Thicker vegetation and the paths

Illustration 48: Multi-layered vegetation

Illustration 49: Sports court

Illustration 50: Pond and the fishermen

SHIBA PARK
芝公園

Illustration 51: Map of Shiba Park

Date & time of visit: 2017-04-05, 14:00

Access: Free, open all day. Closest subway/train stop: Shibakoen station or Onarimon station on the Mita Line is connected to the park. Or a 10 minute walk to Hamamatsuchi station on the JR Line.
Size: 1,5 ha (The park is ring-shaped and has no official area measured. An estimation was made by the author).
Visitor rating from map site: 4,4 p.
Average eco-point: 1,8 ep.
Founded: 1873

Tag-line from Tokyo Park Department: “One of the oldest parks in Japan”

History: Shiba park was built together with Ueno (Ueno Park will be presented later in the text), Asakusa, Fukagawa and Asukayama in the late 19th century. The park used to be the whole area, but it separated with the Zojo Temple after the World War II.

Impression: The park is a circle surrounding Zojo Temple and a hotel with its garden. The garden and park has no visible border more than that it changes in design. Most of the park is smaller grasslands with single standing trees. One bigger area has a lawn and some flowerbeds, and a denser forested area with very steep steps and a viewpoint on top. It leads down to a more calmer

area designed with flowering trees and meandering paths which is also popular for cherry blossom picnic. The north side of the park circle is very close to Tokyo Tower and has a 10 meter waterfall surrounded by Japanese maple trees, which will be very beautiful in autumn.

QUESTIONNAIRE

1. Are there logs that can be used, or dead wood left on the ground?

No.

1 ep.

2. Are there food possibilities?

No.

1 ep.

3. Is there vegetation that can help with water flow regulation and run-off mitigation?

Most of the park is flat, the vegetated part is very steep and can not hold the water for long.

2 ep.

4. Is the park contributing to a temperature regulation?

Yes, it holds some trees.

2 ep.

5. Is the park contributing to a noise regulation?

No.

1 ep.

6. Is the park contributing to air purification?

Yes. But just a few vegetated areas.

2 ep.

7. Is the park contributing to moderation of environmental extremes?

No.

1 ep.

8. Is the park contributing to waste treatment?

It is very clean and only a few leaves are found.

1 ep.

9. Is the park contributing to climate regulation?

No.

1 ep.

10. Is the park contributing to pollination and seed dispersal?

Some flowerbeds are placed, but no visible insects or animals visible.

2 ep.

11. Is the park contributing to recreation and cognitive development?

Yes.

5 ep.

12. What kind of animal sighting/signs can be found?

A few pigeons.

2 ep.

13. Is the park accessible for everyone?

All paths are paved, and only steep area is with steps.

14. What are the recreation possibilities in this park?

Cherry blossom picnic. Children playing catch on the big lawn. Soccer play. Stroll with baby carriage. Lunch break on the benches.

15. What is the atmosphere in the park?

Short visit city park.

16. Other special features in this park?

Waterfall.

Illustration 52: The lawn and the flower beds

Illustration 53: The river is dry in spring but get full when the rain season comes

Illustration 54: Elevation and stairs

Illustration 55: Flower area

HINOKICHO PARK
檜町公園

Illustration 56: Map of Hinokicho

Date & time of visit: 2017-04-05, 16:00

Access: Free, open 05:00 – 23:00. Closest subway/train stop: The park is in the middle with just a 10 minute walk to the stations Roppongi, Roppngi-ichome, Nogizaka and Akasaka.
Size: 1,6 ha (Minato city, 2015)
Founded: (no exact year stated)
Visitor rating from map site: 4,4 p.
Average eco-point: 1,7 ep.

History: The area was a garden to the villa of Mori Family during the Edo period in 1603-1868. The residence was known as Hinoki (the Japanese name for cypress) Mansion. Since Minato ward took over the area, there has been no change in the design of the former garden. (Tokyo Midtown Management, 2010)

Impression: The park has a beautiful view over the pond and a resting house. There is a big lawn with some artificial grassed hills and a modern playing equipment, that is popular with kids. The lawn is not big but the space there is is packed with people and their picnic under the blossoms.

QUESTIONNAIRE

1. Are there logs that can be used, or dead wood left on the ground?

No.

1 ep.

2. Are there food possibilities?

No.

1 ep.

3. Is there vegetation that can help with water flow regulation and run-off mitigation?

A pond in the middle can catch some water, but it is not a the lowest point of the area. The vegetation is not sufficient.

1 ep.

4. Is the park contributing to a temperature regulation?

Moderately. Very few trees, no particularly high or wide.

1 ep.

5. Is the park contributing to a noise regulation?

No.

1 ep.

6. Is the park contributing to air purification?

Very little, since there is not so much vegetation.

1 ep.

7. Is the park contributing to moderation of environmental extremes?

No. Very windy.

2 ep.

8. Is the park contributing to waste treatment?

Very little, all vegetation is very cleaned.

1 ep.

9. Is the park contributing to climate regulation?

Some leaves are left, but most is cleaned away.

1 ep.

10. Is the park contributing to pollination and seed dispersal?

Many flowerbeds and flowering trees and bushes.

4 ep.

11. Is the park contributing to recreation and cognitive development?

Yes.

5 ep.

12. What kind of animal sighting/signs can be found?

None. Not even pidgeys.

1 ep.

13. Is the park accessible for everyone?

Yes, mostly. No steps, but a few sloping paths.

14. What are the recreation possibilities in this park?

Walk with dogs. Resting and watching the nature by the rest house. A small basketball court. Kinds by the playing equipment. Cherry blossom picnic with friends and family. Some seniors on a stroll.

15. What is the atmosphere in the park?

Beautiful walk thought city park.

16. Other special features in this park?

Modern playing equipment.

A resting house by the pond, open 05:00 – 22:30.

Illustration 57: Flower beds by the paths

Illustration 58: Hanami on the lawn

Illustration 59: Pond and the side of the rest house

Illustration 60: The lawn and part of the playing equipment

YOYOGI PARK & MEIJI JINGU FOREST
代々木公園 & 明治神宮の森

Illustration 61: Map of Yoyogi Park together with Meiji Jingu forest

Date & time of visit: 2017-04-06, 14:00

Access: Free, open all day. Closest subway/train stop: Harajuku station and Yoyogi koen station.
Size: 54 ha (124 ha)
Founded: 1964
Visitor rating from map site: 4,2 p. & 4,1 p.
Average eco-point: 4,1 ep.

Tag-line from Tokyo Park Department: “Forest park where the sky is broadest in Tokyo”

History: The area was a USA military field for the navy during the World Was II. Afterwards it became Washington Heights house barracks, and the Olympic Village for the Olympic Games in 1964. Then is became a public park. (Tokyo Park Association, 2017)

Note: Yoyogi Park is one of the largest parks in Tokyo. But combined with Meiji Jingu forest, it is the second largest (after the Imperial Palace garden) vegetated area within the 23 wards. Since the park and the forest has no physical border that divides them, I combined them in this analysis since it is what the nature within it has done.
Impression: Yoyogi Park is one of the largest parks in Tokyo, and definitely one of the most popular ones. The big lawns, the thick forest and the relaxed atmosphere lures people from all over Tokyo to

this area. During hanami season this area is totally jammed with people and their picnic blankets, loud music and happy voices. The park has a pond with 3 fountains that spays up to 30 meter and light up in the evening, alongside with a boarded bridge with benches by the water. There is also a bird sanctuary, a separate cycle path that runs thorough the park, a large dog park with trees and obstacles, a smaller themed flower garden. The huge forest that combines Yoyogi and Meiji Jingu is originally a temple garden dedicated to the Emperor Meiji. It was originally designed with 100 000 trees, all planted by hand. Now it has grown even more, and has a very important role in biodiversity and it's biological values in the else so hardened city of Tokyo.

QUESTIONNAIRE

1. Are there logs that can be used, or dead wood left on the ground?

Yes, but few.

2 ep.

2. Are there food possibilities?

No.

1 ep.

3. Is there vegetation that can help with water flow regulation and run-off mitigation?

There is a lot of vegetation in Meiji Jingu forest, witch is dense and free growing.

5 ep.

4. Is the park contributing to a temperature regulation?

Yes, a lot of shade.

5 ep.

5. Is the park contributing to a noise regulation?

Trains can be heard from one side and the road from the other. Never silent, but sometimes quiet.

4 ep.

6. Is the park contributing to air purification?

Yes. A lot of vegetation to capture particles.

5 ep.

7. Is the park contributing to moderation of environmental extremes?

The lawns are very windy, but the dense forest gives protection. The forest can drink a lot of water when flooding occurs. Also there is a flooding safety system underground.

5 ep.

8. Is the park contributing to waste treatment?

Yes.

5 ep.

9. Is the park contributing to climate regulation?

Yes. A lot of vegetation biomass.

5 ep.

10. Is the park contributing to pollination and seed dispersal?

A small area of flower beds, and some flowering trees.

3 ep.

11. Is the park contributing to recreation and cognitive development?

Yes.

5 ep.

12. What kind of animal sighting/signs can be found?

A lot of birds are heard in the forest, and the bird sanctuary. Pigeons and crows where there is a lot of people. Butterflies by the flowers.

4 ep.

13. Is the park accessible for everyone?

Yes. Good paths and not tilted.

14. What are the recreation possibilities in this park?

Mostly meet-up for cherry blossom picnic or games. At the gates there is a bigger square where performance artist and musicians show their skills, and skateboarders play. Food trucks gather by the paths. Jogging, bicycling, dog walking, seniors and young people stroll around the paths. The cycle path has a “terrain route” and tandem and mountain bikes can be rented. The lawns are crowded by picnic blankets, baseball play, ball games,

15. What is the atmosphere in the park?

Popular and lively large city park.

16. Other special features in this park?

A very good location might be the biggest reason for this popularity.

Illustration 62: Meiji Jingu forest

Illustration 63: Flower beds in the middle of the park

Illustration 65: The pond by the bird sanctuary, and the forest

Illustration 64: The bicycle trail

Illustration 66: Hanami under the cherry blossoms

Illustration 67: Pillar hall type of cherries

UENO PARK
上野恩賜公園

Illustration 68: Map of the Ueno Park

Date & time of visit: 2017-04-06, 16:00

Access: Free, open all day. Closest subway/train stop: Ueno station, on JR Line, is just by the park.
Size: 53,9 ha
Founded: 1873
Visitor rating from map site: 4,4 p.
Average eco-point: 1,9 ep.

Tag-line from Tokyo Park Department: “Culturally blessed forest known for its cherry blossoms and Shinobazu Pond”

History: In the Edo period this area was part of the Toeizan Kaneiji Temple. It got restored to the government during the Meiji period, and later on donated to Tokyo city. Ueno park opened as a park together with Shiba Park and two others, and was one of the first parks that opened in Japan. Originally the park only consisted of the mausoleum of the temple, a Toshogu shrine and the cherry blossoms that was part of the garden. The zoo and the other museums later on made the park even more cultural. (Tokyo Park Association, 2017)

Impression: One large part of the park is the oval Shinobazu Pond (不忍池) of almost 11 ha and measures 470 meter by the length. It’s famous for the lotus flowers that will cover almost the whole

pond in summer. The park is more squares and museums than nature, and very popular. Especially for the old cherry blossoms.

QUESTIONNAIRE

1. Are there logs that can be used, or dead wood left on the ground?

No.

1 ep.

2. Are there food possibilities?

No.

1 ep.

3. Is there vegetation that can help with water flow regulation and run-off mitigation?

Some trees are in bare soil or in vegetation, but most are paved very close to the stem.

2 ep.

4. Is the park contributing to a temperature regulation?

A little few vegetated areas.

2 ep.

5. Is the park contributing to a noise regulation?

Some trains are audible, but the most noise comes from the visitors.

2 ep.

6. Is the park contributing to air purification?

Yes butJjust a few vegetated areas

2 ep.

7. Is the park contributing to moderation of environmental extremes?

A bit of water can be held in the big pond, but the volume is limited. Wind is strong inside the park.

1 ep.

8. Is the park contributing to waste treatment?

No.

1 ep.

9. Is the park contributing to climate regulation?

Yes.

2 ep.

10. Is the park contributing to pollination and seed dispersal?

There are some themed flowerbeds and special seasoned vegetation beds.

3 ep.

11. Is the park contributing to recreation and cognitive development?

Yes.

5 ep.

12. What kind of animal sighting/signs can be found?

Crows and pigeons by the trash-bins.

1 ep.

13. Is the park accessible for everyone?

Yes, flat and accessible grounds.

14. What are the recreation possibilities in this park?

Cherry blossoms picnic is very popular, strolling and watching flowers and eating ice cream, dog walk, etc.

15. What is the atmosphere in the park?

Lively park for amusement.

16. Other special features in this park?

Peony garden, Zoo, museums, Temples, food kiosks.

Illustration 69: The plaza with fountains and a museum in the background

Illustration 70: Playground and some flower beds

Illustration 71: A rest area and the pond with the lotus flowers

Illustration 72: A plaza with cherry trees

Illustration 73: Hanami on a path

Illustration 74: The bigger pond with boats

MIZUMOTO PARK
水元公園

Illustration 75: Map of Mizumoto Park

Date & time of visit: 2017-04-17, 15:00

Access: Free, open all day. Closest subway/train stop: Kanamachi station on Chiyoda Line, 15 minutes from Nishi-Nippori station on the JR Line. Walk is approx 2 km, and takes 20-30 minutes.
Size: 96,3 ha (largest park in Tokyo's 23 wards)
Founded: 1945
Visitor rating from map site: 4,3 p.
Average eco-point: 4,2 ep.

Tag-line from Tokyo Park Department: “Broad water, sky, and grass”

History: This area used to be part of Tokyo Metropolitan Edogawa Suigo Natural Park until 1975. It is the only place that has a riverside scenery in the town. (Tokyo Metropolis Park Association, 2017)

Impression: A calm and peaceful large park area. The park has a lot of water, with ponds, streams, canals, swamps and a waterfall. It seems very good for creating different habitats for flora and fauna. Around the streams grow thick vegetation of singular species only, such as a Metasequoia, Katsura, Alder, Swamp cypress or Poplars. And inside the pond and stream grows many kinds of Water-lilys and Lotus plants. The thick forests and and the big lawns make this a popular spot for

sports and playing. The park has a BBQ section where you can buy supplies in a kiosk, and an camping area. Even though the pond is big, it is very calm and quiet and does not allow rowing boats etc. The people who come here merely look at and admire the power of nature. Wetland board walks, natural flowerbeds, tree information signs and flowerbeds in boats is other features in this park.

QUESTIONNAIRE

1. Are there logs that can be used, or dead wood left on the ground?

No.

1 ep.

2. Are there food possibilities?

No.

1 ep.

3. Is there vegetation that can help with water flow regulation and run-off mitigation?

Yes, thick forests and large water plains.

5 ep.

4. Is the park contributing to a temperature regulation?

Yes, but not on the big lawn. Trees are formed in forests, clumps, alleys or singular standing trees, and they are mostly everywhere.

5 ep.

5. Is the park contributing to a noise regulation?

Yes, it’s very quiet. Thanks to the dense forests and the large area.

5 ep.

6. Is the park contributing to air purification?

Yes. A lot of vegetation to capture particles.

5 ep.

7. Is the park contributing to moderation of environmental extremes?

There is no flooding plan, but all the streams and the pond will hold a lot of water. The forest catches most of the wind. The area has an evacuation plan.

4 ep.

8. Is the park contributing to waste treatment?

Yes, the bushes and trees all get to keep most of the leaves. Grass is left is some places.

5 ep.

9. Is the park contributing to climate regulation?

Yes. A lot of vegetation biomass.

4 ep.

10. Is the park contributing to pollination and seed dispersal?

Meadows, flowering water plants, flower pots etc.

5 ep.

11. Is the park contributing to recreation and cognitive development?

Yes.

5 ep.

12. What kind of animal sighting/signs can be found?

Many birds, water and forest living. A bird sanctuary protects many of them. Fish in the streams.

5 ep.

13. Is the park accessible for everyone?

The paths are flat, but no blind routes on them.

14. What are the recreation possibilities in this park?

Dog walks is very popular, cherry blossom picnic, fishing, watching flowers, watching birds with binoculars, biking, jogging, etc.

15. What is the atmosphere in the park?

Calm, close to nature.

16. Other special features in this park?

A scene on a plaza, an amphitheatre close to the lawn, BBQ shop, food kiosks, emergency evacuation area.

Illustration 76: Wetland with board walks

Illustration 77: The big pond and a path by its side

Illustration 78: Homogeneous tree stands gives a powerful effect

Illustration 79: Flower beds with natural edges

Illustration 80: A small river and trails into the forest

Illustration 81: Metasequoia stand and benches inside

Illustration 83: The great lawn

Illustration 82: A hidden waterfall

INTERVIEW 1
WITH ARATA ICHIHASHI

Place: Tokyo Metropolitan Government, Koto-ward, Tokyo, Japan

Time: 2017-Feb-09. 15:00 ~ 16:30 (1h 17m)

Participants:

Amy Berggren [AB]
Interviewer, master student at Swedish University of Agricultural Science

Tsuyoshi Honjo [TH]
Professor, Environmental Science and Landscape Architecture Course, Graduate School of Horticulture, Chiba University

Nobumitsu Tsumematsu [NT]
Researcher *in Atmospheric Sciences and Certified Weather Forecaster at Tokyo Metropolitan Research Institute for Environmental Protection*

Arata Ichihashi [AI]
Chief For Urban Environment & Climate Change Division (Coordinating Supervisor, General Affair Division Bureau Of Environment Tokyo Metropolitan Government)

Interviewed language: English

time laps (mm:ss)

[AI] This is rainfall. First of this one is integration drainage. Then this part is like using pipe, so drainage facility measures. And this is for retention facility. And this is for house, like individual facility measures. We make more higher foundation for house. Then this part evacuation and software measures. This is storm-water management policy in Tokyo. This is over-all.

This is retention pond in underground. Size is 12 meter with. Only sewage retention pond. In the future, they think, to connect to Tokyo Bay. But not yet.

[AB] (where does it go?)

Just 4.5 km. And then stop. This is cleaver way, because, many rivers cross this pipe. So if the rain is here, we can use flexible use of capacity.

(ok, so you can move the water?)

Yes, because this is only one 4.5 km pipe.

(do you use pumps to get it out?)

Yes, pumps, water goes to river or same sewages.

3:47

I think you can see this facility, because Tokyo Government has this facility, and sometimes they have citizens a chance to see this.

3:52

This is actually not proper storm water management, but this is… Maybe you come here by subway? This is Toyocho station. This is the entrance of this station, and this area is very low. So if water come up, still you can use, because – stairs. You have to walk up, then go down. Then if the water comes up, this level, you can close the door.

So if the water comes up here, you can close the door. You can use all the function of the subway.

(did this ever happen, did you get flooding?)

Yes sometime. Nowadays very strong rain, in very small area. Like 100 mm/hour rain. It' s so strong. So sometimes water comes in. It' s not river flood. It' s surface flood.

(so if the water comes here, you just close the door?)

Yes, you can loose only the function of the entrance. Subway system has an air-intake. So if flooding, the water comes in through the ventilation. It' s very strong.

6:48

This is a software. It' s is a real time warning system. This is a river warning system. You can see the river water level, in your room. You don't necessary go to river. And if you see here in interest, you can evaluate.

(so there will be an alarm?)

No alarm, but you can see all the time, by internet. This is Tokyo, so this point.

(So every river is monitored?)

Most of the rivers.

9:40

home security plan

11:00

Suida-ward. Elementary school renovation. First case of this type. Al lot of old schools, so this type will be built every year. This school will be a place for people living here to go to in emergency.

15:34

They change the policy 50 mm to 75 mm. This is the way to equal.

50 mm/hour is quite big

depends on the area

It is often 50mm/hour. 10 times/year. Only small areas. Mostly in summers.

19:50

The skyscrapers in Shinjuku makes it rain more in that area. We are not sure.

All Tokyo, I think the rain is higher. 5 – 10 times higher for over 50 mm/hour. This kind of small area is 500kvm.

22:37

This time, rain is getting strong. Drought is not really.. No... It' s difficult to project. And now typhoon is getting bigger, but probability down.

(stronger but fewer?)

Off course temperatures go up. Maybe more dry, but not sure.

24:45

I have to say. Climate adaptation is not popular in japan. I think we are very, very slow compared to other. One half years ago, National Government made a adaptations plan. But it is not obligation for local government. Some local government start to make a plan for the adaptation, but not so many. Maybe half. Now they try to make a policy, not actual plan.

(so it' s in the beginning)

In the beginning. They upgrade plan. But they always see - past, not for the future. So they don' t think about this.

(hehe, problematic right)

That – problem.

It need money.

26:28

(they don' t believe in climates change?)

Anyway we have lots of distastes so we are preparing. Anyway we should do this.

Most of the major, concrete major is very advanced in Tokyo. We have to think about climate change. Thats why, purpose, most of the people don’t understand about adaptation. They know climate change. Thats the problem.

So situation is like this: if you want to interview to some section to government. You say “I want to know about adaptation”. They don’t know. “I don’t know about adaptation”. Like that. Most of the people come to me, because if you go directly to government, they do the flood management and heat management, but they don't know about adaptation.

30:05

Mostly we don’t have the green facility for the flooding. Mostly it’s a permeable facility. If you make a green area instead of pavement area, off course it’s easier to... permeable... water’s easily into ground. They say this kind is permeable pipe or peek or pavement or gutters or green conversation – is same meaning. We did this like this.

Just make it green, and compare to pavement area. Water is easier to go into ground. Not to systematic.

(maybe the green areas has too slow intake, and in Tokyo you have a lot of water so this system is to slow to actually capture all the rain, maybe that’s the reason?)

[TH] Thats one reason. But we are talking about the section of the government is different. This one, this one, this one. Yearly flood is for the section of drainage or sewage. This is planning and construction bureau.

(but they don’t talk together, cooperate?)

Haha. This is Tokyo flood management policy, they talk about if they make his plan. But actually not so good connected. They gathering and talking about this. They do, but not perfect.

(do you think this is a good way?)

Haha. Not so good. Yes that is one of the big problem.

(is it because Tokyo Gov is so big?)

Yes, that is one of the reason. They try to but sometimes difficult.

34:42

So especially talking about adaptation, very problematic. Many bureaus have to cooperate each other, but it’s problem.

(so it’s financial problem?)

Yes most of the money goes to this bureau, so this bureau don’t have enough money to improve.

(haha yes the greenery is always really low in priority)

Right. And planning bureau have loot of work. So for them flood control is part of they work but the river section is the most important. So thats different.

35:45 (so do you this it will come to Tokyo Gov, green areas is getting popular in the rest of the world)

Yes green infrastructure, this 3-4 years it is getting more popular. We study about many green infrastructure about other case. That is a start.

(do you keep in contact with researchers?)

Researchers and consultant have a lot of information about other countries so they can the information to government.

37:06 [about the green roof pamphlet] (so these are all in Tokyo, are they all by Tokyo gov)

Yes mostly in Tokyo, some by public construction and other private

(is it mostly aesthetically, or for function?)

They think many functions. Now also, we start to think about the functions of the green so this is very new and advanced one.

[TH] This is only rooftops and wall greening, so the amount is not big. The area we can make is very small compared to all area. So I think a better way is the greening of the parks and the trees on the road. But still interesting to see...

(It would be interesting to see if the greenery is collecting the rain water)

[TH] Even though it is green, if the rain is heavy it floods. Because if the rainfall is 100 mm/hour. Everywhere, they can’ t try it.

Actually it is working. They made this pipe here, and it decreased the area for flooding.

(Do you know if this is an old system?)

Not old. Making this facility, takes lot of money.

42:55

[TH] Green infrastructure is a more ecological way, but the amount they can discharge is not big.

My opinion is that we need green infrastructure and gray infrastructure. So we can combine wise way.

(is this why the parks have hard surfaces, like gravel)

I don’ t think so. Do you think so?

[TH] It depends on the designer. If the designer thinks of floods and permeable surfaces, then they use that. Of course they thinks it is cleaner. If it is soil, they think it is muddy. Thats one explanation. In summer the environment is real bad, it’ s too hot.

(do you use structural soils?)

Not really. Haha. Many green infrastructure in other countries use structural soil, but I told you, we didn’ t do that in Tokyo. I know…

47:45

(for the sustainable planet, will you keep these systems?)

We should change. If we think about the future. But changing peoples mind is the most difficult one. For climate mitigation we took 10 years. Now maybe people understand the mitigation of climate change, most of the majors main streaming already. I think for the greenery or adaptation and biodiversity there is new problems, and people understand in the future. Slow change I think.

(what are the new methods?)

Actually, my specialty is adaptation planning. I think green infrastructure is one of the thought, especially in adaptation. In another meaning - in japan, participation of the people is not like in European countries. So it’ s most important, especially for adaptation to… I think we need more new method for participation people or gathering people opinion.

(people in Tokyo is not involved in climate change adaptation?)

We have a system: public comment. But not many people do that. Because government is not so keen to public comment. Their behavior is just like, “here and ok”. They don’ t reflect their opportunity to their policy. I don’ t know how to improve governments behavior. I don’ t know how to improve citizens behavior.

51:53

[TH] We usually sensible to disaster. And preventing the disaster is big issue. That is top priority.

People are sensitive to the environmental program, but not the majority. But the numbers are increasing. So the situation will change.

These kind of construction need a lots of money, and are not very good for economy. So many politicians won’ t make this plan.

[TH] We spend a little portion of money on these adaptation, and we say it is good.

(do you have other systems?)

We have a lot of tanks, but not as big as this one.

(can I see some?)

Some are open for public, but too see the school will be difficult – because it is a school

(can I have GIS files?)

I don't have. But you can find lots of information on the internet, mostly on the gov homepage.

1:03:04

(do you use bio-swale? Or rain garden?)

Like a wetland, we have it in the park. But I don't know that you can call it bio-swale.

(so it's only for aesthetic purposes?)

Yeah. But some pond takes a lot of time, so it is already part of the ecosystem. Haha.

Actually we don't have a concept of green infrastructure. Just we know this for 3-4 years, so most of the facility now is just "pond, is pond".

[TH] In the countryside in the farming place there is a lot of rivers. But rain is not so many. But in urban area it's very few.

(because of the space?)

We make many pond or wet land for the eco-diversity, but this we can call a bio-swale I don't know.

We have a lot of pond, but thats for beauty or biodiversity, actually many rainwater comes in to the pond because it's a pond. But it is not the purpose to gather flooding water.

[TH] In some places, they preserve place to at the time of the flood, that the water is stored there. But nowadays even hat place there is a lot of hard surfaces. And also it is difficult to find a place in a urban area. Space is very limited.

1:08:49

(subway station)

Many subway is like this. Most of the subway has this kind of thing. But his area is very low, so they make this.

(if there would be a sea level rise, do you use these kind of things?)

We have protection for the sea level rise or high tide. Standard is 6 meter. Sea level is always going up and down, because of the tide. And highest tide is around 2 meters. And we 4 meter allowance. And also, Tokyo Bay's shape is like this... So if tsunami coming like a small mouth, then it's not so.

(there has never been a tsunami in Tokyo?)

Only very small, like 50 (cm)... I think I don’t know 5 meter tsunami. Even in 2011 we didn’t get any damage from the tsunami.

[TH] Totally, I think there is a few record about that. We are not sure, after 1000 years or some 1000 years there might be some big tsunami come, coming into here.

(but there will be a sea level rise in some 100 years)

Maybe problem. Haha.

(so it’s covered in this 4 meter protection)

So adaptation is important. Haha.

1:13:24

[TH] We don’t see the sea level is going up so much. We are not sure. Maybe.

For the predictions, next 100 years. We have 4 meters allowance. Bureau have important dyke's around the sea, and they now had a problem about the earthquake. So old dike don’t have enough stronger about earthquake, now they try to improve the earthquake protection.

Thank you for the interview!

[Approved by Arata Ichihashi via mail correspondence 170427]

INTERVIEW 2
WITH ISAMI KINOSHITA

Place: Chiba University, Matsudo town, Chiba, Japan

Time: 2017-April-17. 11:00 ~ 12:20 (1h 20m)

Participants:

Amy Berggren
Interviewer, master student at Swedish University of Agricultural Science

Isami Kinoshita (refer to as “I” and “me”)
Professor, Environmental Science and Landscape Architecture Course, Graduate School of Horticulture, Chiba University

Interviewed language: English

(time laps = mm:ss)
1:00
Minamata, Kyushu. Because of pollution we want ecology. First idea.
Minamata-byo. 1956. Nitrogen pollution.
Polluted water with mercury, into fish, fishermen, people, children sick.

6:00
students wanted to clean the river
Seiwa-mori, name of the an officer in Yokohama. Eko city laboratory.
”ECO-UP” 1980
‘Tanken’, explore, learn

10:00
children is one part of the ecological system
seiw-mori made playground in school yard, environment education.
Biotope. Dragonflies became symbol for the movement. (tombo)

14:00
park come later.
Public park, is urban planning
previously its called children’s park, and now its called block park. And neighborhood park. And district park. And comprehensive park. At that time we didn't care for urban ecological system. Then came the EU park, Hibiya park. Most beauty, provide park for ppl to take rest. More artificial, not ecological

17:00
then come the concern, how can we eco-up the park

I wrote a book (showing book, explaining)
I created a pocked park with mud. But the government didn't like it. Don't want insect or leaves or mud. But its better for children. I realized that “children is one part of the ecosystem”

21:00
I made a 3 generation play map. Interview w 20 ppl who grew up in the neighborhood. 1930, 1960, 1982. the environment changed in that time. A behavior map, and a cognitive map. We saw how the natural environment disappear. From the interview we realized the ppl saw it like poetry. The imagination of nature is very important.

26:00
children think park is boring. Playing equipment has just one function. No grass, river, field. We need to make urban parks. So the children can select what they want.

27:00
we created imagination playground, natural playground: Water, fire, mud.
In pocket park, we planted flowers.

29:00
previously it was water stream, now its covered. Workshop : “revive the water stream” 1985-1992
first the government created water stream from waste water from swimming pool. Kind of sewage. But we realized in the workshop that is is not good. We can use ground water and rain water. But it was too early. The gov didn't like. We had to redesign.

34:00
in 1990 that kind of idea of the urban ecology is growing. Learning from experience. Created “sumida green way”, “kitazawa gawa green way”. Much eco-up. Citizen takes care of the river. Cleaning.

36:00
adventure playground. Lot of activity. Kind of a laugh ground. Water, fire, mud. Play-leader taking care of fire. Idea from Denmark in 1944.
we are part of animals. Top of the umbrella.

43:00
if the children are pure, they like the environment. Most mother don't like the nature. They think its dirty. Don't like insects.
We used vacant lots. Made adventure play. Mud and fire. Build house etc. and the insect came.

46:00
in Setagaya. We want to make park. But the mothers don't want artificial park. Want nature. So they went to the mud places. I ddnt learn the importance of mud in school, but they mothers new.
Children couldn't have mud and water. Dirty. Small element are important.

50:00

edible landscape. But so many restrictions. Who takes care of the rotten fruit afterwards. Hand made equipment was prohibited. I knew community garden (was environmental management system). Mud & edible. Different. Created “Tojo minna no” in Chiba.

54:00
municipality don't like eco-up. Limited budget. Maintenance is done by citizens. Yokohama is one of the advanced municipalities, cleaning river, biotopes, urban design, collaborate with citizen etc

56:00
budget 500 million from government. Involve the ppl.
Student want to create more natural, clean river, nature etc.
made by citizen and student. Not gov.
“parks friend” koen-aigokai. Was created. In yokohama. Volunteer works, to make park more eco.

58:00
in chiba, satoyama (rice field+mountain). Protect the forest and mountains. Using fields to clean the water. Good for biodiversity. Interact with ppl. Keyword for ecological environment, satoyama is word. Satoyama park etc. “21st century Mori-to-hiroba” park in matsudo. Paddy fields also.

1:04:00
Mizumoto park. Good biodiversity. had paddy fields.
Maioka koen. At first this was made by citizen. Abandoned paddy fields.

1:06:00
recently the gov understand ecology.

1:09:00
I realized that there is many restrictions from th gov, I can not take decisions. They don't care for mud. We need the citizens for harvest and maintenance. We want to create funny and useful things. There is a Apple Promenade on streets, not yet in parks. Citizens enjoy it. 1980 I was in park department. Eating is individual, that is privatization. Park is public, but eating is private. That is a challenge for me.

1:12:00
first I planted potato. But the neighbor claim, “not a citizen farm”. Then I try edible way. Planted in front of the house. Ppl try to cook together. I learned from community garden.

1:14:00
eco-up. Citizens involvement. Children is nature. Everywhere is a playground. They don't have friends nearby. They need to be stimulated. Play leader.

1:15:00
if park is good, then family will come and live in the municipality.

Thank you for the interview!
[Approved by Isami Kinoshita via mail correspondence]