Dongtan-2
A Premise for Urban Living
Water District

동탄2
도시 생활의 모델
수(水)구역
UDL
Urban Design Lab at The Earth Institute
Columbia University
www.urbandesignlab.columbia.edu

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Principal Investigators
Richard Plunz
Richard Gonzalez
Leo Daehwan Chung

Support Staff
Meria Paola Sutto
Tong Heo
Dongseoi Kim
Merc Leverant
Zoe Matirios
Xiaomeng Xu
Sang Ok Kim
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Dongtan:
1. Eastern Shallow, Asian terminology
2. A physical site condition of lower elevation utilized for collection and storage
"WATER SUPPLY PLUMMETED BELOW 60 PERCENT in the 1960’s after the inclusion of the GYEONGGI DISTRICT with poor water supply facilities towards the Seoul administrative boundaries."

Foreword

As cites throughout the world continue to develop, the growing population will also experience new needs for water, food, and housing. With these demands, cites will further evolve into mega-cities and regional centers. In order to cope with this growth, satellite cities are being developed near or along the edges of large cities. They will be connected through infrastructural systems related to energy, communication, and transportation – vital systems for sustaining residential, working, and recreational communities. Seoul represents one such example, where clustered dense communities strategically placed around the main city are expected to address the issues related to urban expansion, population growth, and economic development.

Dongtan-2 has come at a critical moment for the evolution of our urban environment, and I am encouraged by the intensity with which our partners and team members have embraced the need for integrated design with long-term vision. Dongtan, rich with vibrant waterways and historic land use precedents, provided an ideal site for implementing cutting-edge strategies for a new urban conception. Inspired by its existing agricultural landscape and topography, the team has reinterpreted key elements from the existing ecology as an underlying principle in the vision of what lies ahead for Dongtan. We insisted that we not rely on predetermined traditional definitions of urban design, and instead looked to Dongtan itself for site-specific guidance in sustainable urban practice. The goal: create an urban model that allows long-term sustainability for both the environment and the inhabitants of Dongtan-2.

In thinking about sustainable cities, the team insisted on investigating the whole life-cycle of each element in the project, and only implementing those with steady positive returns for the environment. Unlike typical urban developments, in which the cost-benefit analysis tends to favor immediate savings over long-term savings, our proposal for Dongtan-2 strongly favors investment in long-term sustainable infrastructure, materials, and building design, as well as in education and preservation. As watersheds have historically driven the land-use practices in the region, we looked to this natural element as a fundamental organizing principle for the new urban site. By making water integral to the city’s identity and vitality, we protect it. By promoting understanding of the value of water in urban settings, through demonstration and integration, we encourage a culture of conservation.

The following report explores several ideas addressing the issues pertaining to a new generation of ecological cities. I encourage ongoing conversation and dialogue between government officials, policy makers, educators, planners, urban designers, and architects. The contribution of each is fundamental in strengthening these new urban projects with high ambitions and valuable experience. The final project can only benefit from an array of influences and ideas, allowing Dongtan-2 to serve as a prime example of ecological urban life.

Richard Plunz
Director
Urban Design Lab
세계 도시의 도시들이 계속 발달함에 따라 인구 증가와 함께 물, 식량 및 주택의 수요를 경험할 것이다. 이 수요 증가와 함께, 도시들은 지방 중심지와 대도시로 더욱 발달할 것이다. 이 증가에 대처하기 위해서 도시 수원이나 범무더리 위성도시들이 개발되고 있으며 이 도시들은 주거, 교육 및 여가를 제공하는 중요한 체계적인 에너지, 통신 및 운송 인프라 체계들을 연결할 것이다. 이런 인구 증가, 경제 개발 및 도시의 평창에 대처하기 위해 고밀도의 도로소도시들이 전략적으로 도시 주변에 위치한 시설은 이러한 좋은 예이다.

동탄-2는 도시 발전사의 중요한 순간에 나타났고, 나는 향기적인 비전을 가진 통합적인 디자인의 필요성을 기꺼이 밝힌 우리 팀의 열정에 기인하여 북돋아졌다. 동탄은 증가하고 원활한 수요와 도시 사용의 억제적 손계를 통해 신도시 개발 창조적 최첨단 과학을 실현할 수 있는 이상적인 장을 마련해 주었다. 기존 농지를 경계로 구간을 얻은 팀은 동탄 미래 비전을 위한 기본 원칙이 되는 핵심 요소들을 기존 생태환경에서 점검해 해냈다. 우리는 이미 설계된 전통적인 도시 설계 정책들에 의존하지 않은 것을 주장했으며, 동탄 배지 특성 자체에서 단지를 갖는 지속 가능한 도시 설계 방식을 탐색했다. 목표: 동탄-2 주민들과 환경이 함께 경제적, 지속 가능한 도시 모델의 창출.

우리 팀은 지속 가능한 도시를 생각함에 있어서 프로젝트의 각 요소의 전체 파이프라인을 연구하려 역할했고 그 중 가정적으로 환경에 부합적인 영향을 가져오는 요소들을 더함했다. 일반적으로 비용을 충분히 보장하고 도장의 절약을 경제적인 혜택보다 우선 순위로 생각하는 경향이 있는 전통적인 도시 개발과 다르게 동탄-2는 재료, 건물 설계, 교육, 보존 및 장기적으로 지속 가능한 투자를 지지한다. 역사적으로 분수개는 그 지방의 토지 이용을 결정해왔으며 우리는 이 자연 요소를 새 도시의 근본 정책 원칙으로 삼을 것이다. 우리는 복수 도시의 경제성과 환경을 위해 통합하면서 이를 보호하는 기회를 만들 수 있다. 우리는 도시 안의 물 전시와 통합을 통해 환경의 물 가치 이해를 증진시키고 또 절약 문화를 장려할 수 있다.

이 보고서는 전 세계 생태도시와 관련된 문제를 다루는 여러 아이디어를 탐색한다. 나는 정부 관리, 정책 관리, 교육자, 도시 개발자, 도시 설계자 및 건축가의 재료는 토론과 대화를 장려하고 싶다. 이 각자의 기여는 억제적 목표와 가치있는 경향을 가진 이 이론적 도시 프로젝트를 강화하는데 매우 중요하다. 여러 아이디어와 여러 영향력들은 최종적인 프로젝트에 이론적을 적용할 것이며, 동탄-2를 생태적 도시 생활의 올림 모범 사례로 존중하게 할 것이다.
Earth is at a critical crossroads. While revolutionary advances in science and technology have lifted humanity to new heights of prosperity and longevity in many parts of the world, hundreds of millions of people are vulnerable to the impacts of hazards and natural disasters, extreme poverty, infectious disease, and a host of other challenges. At the same time, human activity, especially in the last 100 years, is threatening the health of the environment and potentially posing risks of unprecedented magnitude to our shared future. Today, approximately one in six people on the planet subsist on less than $1 a day. The world’s population is expected to increase to 9 billion people by 2050, further straining Earth’s resources and humanity’s ability to thrive. With a window of opportunity to head off the most severe impacts of these challenges, the Earth Institute, Columbia University, is working to help the world pave a path toward sustainability.

The Earth Institute is confronting the 21st century’s most pressing problems by taking a bold and innovative approach to achieve sustainable development. This approach prioritizes the protection of Earth’s ecosystems, oceans, and atmosphere as well as the spread of social and economic opportunities for all people. To achieve sustainable development, the Earth Institute is conducting and applying interdisciplinary scientific research to address many cross-cutting issues. We believe that finding solutions to one problem, such as extreme poverty, must involve tackling other related challenges, such as environmental degradation and lack of access to health care and education. Anchored in this unique approach, the Earth Institute is leading the way in this promising and dynamic new field.

The EI has categorized its research into nine thematic issues — water, energy, urbanization, hazards, health, poverty, food/ecology/nutrition, ecosystems, and climate/society. These themes are studied in a variety of combinations by the thirty research units that make up the Earth Institute. The following page highlights the main issues surrounding each theme.

“ECO-EFFICIENCY is often expressed as the creation of more value with fewer resources and less impact, or DOING MORE WITH LESS.”

Water
Regions in every continent experience periodic water stress, but water constraints may soon be chronic in many parts of the world. Sustainable water resource development, planning, and management are now global challenges, as rapidly growing populations demand increasing amounts of water. This increased use, along with a changing climate, is constraining fresh water availability in many regions. Principles of water allocation and governance need to be revised to promote efficient water use as part of a sustainable development strategy, as water supply and consumption are changing in significant ways.

Energy
Energy issues are an important part of a sustainable future, as increasing demands for energy is paired with diminishing resources and strained world politics. As part of an integrated approach to energy conservation and independence, researchers are considering policy, education, and outreach while developing new energy technologies for an increasingly sustainable world. By studying the relationships between energy use and subjects such as climate change, water, poverty, and human health, new systems can be created as we work to define the future of energy for our planet.

Urbanization
The year 2007 marked the first time in history when over half of the world’s population lived in urban areas. Urbanization is ongoing, which means that most people will live far from where their food is grown and will depend on complex infrastructures for their livelihoods. Understanding the interdependencies between rural, peri-urban, and urban areas is an important step towards the development of sustainable models. Urban populations in particular are under acute stress as their populations expand, putting pressure on the areas that support their resource needs and challenging the sustainability of cities.

Hazards
Natural disasters—hurricanes, earthquakes, drought, landslides, and others—can have devastating effects on human populations and economies. Studies show these hazards are on the rise. With increasing numbers of people living in crowded cities and other vulnerable areas, it is more important than ever to advance our understanding of natural disasters and the ways in which humans respond to them.

Health
Global health is greatly affected by factors such as changes in global and regional climate, water resource quality, food growing capacity, and ecosystem health. Poor human health in turn affects the capacity of the global population to deal with environmental changes and adapt to them. Therefore, global health plays a central role in understanding the adverse effects of development and to find a path that leads to a sustainable future.

Poverty
Extreme poverty is generally defined as living on less than $1 a day. With this definition, over one billion people in the world fit into this category. By taking a “human needs” approach, one can think beyond the dollars to ask whether people have the basics they need for economic growth and sustainable public health. Researchers, scientists, and development practitioners must work together to fight global hunger by addressing its multifaceted root causes: hunger and malnutrition, inadequate access to health care and education, lack of safe drinking water and sanitation, energy problems, trade barriers, and gender inequality.

Food, Ecology & Nutrition
Balanced diets, reliable food sources, clean drinking water, stable agricultural systems tied by predictable water flow, and plant pollinators all contribute to the stability and well-being of a population’s nutritional health. Caloric intake alone is not a sufficient indicator of an individual’s or a society’s nutritional status. Healthy populations require health environments and sufficient nutrients to meet basic dietary needs.

Ecosystems
Healthy ecosystems are important to life on Earth. They provide priceless services such as air purification, water filtration, and food production, and they support a tremendous diversity of plant and animal species.

Climate & Society
Atmospheric emissions of greenhouse gases affect the heat balance of the earth and the direct exploitation of natural resources has significant impact on climate. Conversely, changing patterns of precipitation, temperature extremes, increased frequency of storms, and rising sea levels determine the limits of societal development. While the dynamic interaction between humans and climate is not new, the scale of the interaction has reached unprecedented proportions. For example, population increases lead to problems including water stress, deforestation, air pollution, and soil mismanagement and erosion. In combination with climate change, these stresses directly impact society in many ways, including food production, floods and droughts, and disease and its spread.

Development choices in both industrialized and developing nations must consider both sides of the climate-human interaction: acting for a moderation is greenhouse gas emissions and investing in climate and environment. This climate affects all as aspects of sustainable development by exacerbating other stresses (such as population increase or aquifer depletion) and creating new ones (such as sea level rise). Responsible and pro-active planning requires better quantification of the expected climate impacts but has to go further as all sectors of society are affected. Thus there is a need to develop and evaluate mitigation and adaptation strategies, and improvement the dissemination of information to enable the management of climate risks, policy concerns, and social and political science.

Eco


The current proposed district boundaries for Dongtan-2 do not relate to the existing streams and natural topography that currently run back to the Osan Stream. Development according to these divisive boundaries can lead to complications in design, ecology, and cost. Instead, the natural watershed can be used as a defining feature for a series of developed districts – with the Songbang stream providing a central organizing pathway.

The Dongtan-2 district boundaries are not aligned with the Osan Stream, which flows back to the Osan Stream. Development according to these boundaries can lead to complications in design, ecology, and cost. Instead, the natural watershed can be used as a defining feature for a series of developed districts – with the Songbang stream providing a central organizing pathway.

Principal topological features of Dongtan city
Natural environment in Dongtan consists of five hills and six creeks.

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“OUT OF 10.6 MILLION RESIDENTS, 99.3 PERCENT RECEIVED WATER SERVICE, with per capita daily supply of 427 liters.”
A Vision for Dongtan-2

Green Leaf Metaphor

Water in Urban Contexts
The topic of water in cities will need to be evaluated as the increase of population and density correlate with supply and demand. According to a 2007 United Nations report, 50 percent of the global population live in urban areas; by the year 2030 those figures are projected to increase to 70 percent\(^1\). As people migrate to cities and require resources in housing, transportation, and employment, urban infrastructure systems will need to be evaluated for support and functionality. South Korea has developed a nationwide initiative to spur new town developments centered around its main city, Seoul. With an agenda to foster economic growth through research and development industries, new housing opportunities, transportation infrastructure, and recreational amenities, new town developments such as Dongtan provide an opportunity to take advantage of design strategies that incorporate sustainable development practices and enable efficient living communities.

Dongtan-2: A Hydrological Context
The physical landscape of South Korea is mountainous, composed of slopes and contours with vegetative coverings. These conditions form networks and pathways that connect multiple elevations, such as the natural swales which gently direct the flow of water. The definition of Dongtan reflects the physical context of its natural environment, the “eastern shallow.” Dongtan is made up of a series of watersheds which connect to the Osan water stream at its lowest elevation. These characteristics have fostered conditions ideal for agricultural rice fields, the primary use within the landscape. These fields have maintained the Dongtan site as a rural community for hundreds of years. Within the rice paddies, one can see how techniques of water retention, storage, and distribution have been necessary agricultural implementations for crop survival. All water networks converge at the San-Cheok reservoir, which acts as the water storage unit for the watershed. This reservoir and its surrounding networked waterways, located in the southern area of Dongtan-2, define the Water District. Resembling the leaf of a tree, the district’s physical topography is analogous to the leaf’s structure and anatomy. The direction of water flow, the shape and color to provide shading, all are aspects that can relate to the physical site conditions in this district of Dongtan-2.

South Korea is the fifth largest importer of water in the world. Eighty percent of water sources are utilized for food and agricultural production of which 21 percent are consumed for water crops\(^2\).

\(^1\) UNFPA State of the World Population 2007
\(^2\) 2007 UNESCO International Institute for Infrastructural Hydraulic and Environmental Engineering
동탄-2의 비전플랜

나뭇잎 형태 비유

도시 환경에서의 물
수자원의 수요와 공급은 인구 증가 및 그 밀도와 관련되어 있기 때문에 물과 도시라는 주제에 대한 검토가 필요하다. 2007년 유엔 보고서에 의하면, 인구 인구의 50%가 도시에 거주하고 있으며, 2030년에는 이 수치가 70%로 증가할 것으로 추정된다. 인구가 도시로 이주함으로써 발생하게 되는 도시의 주거, 교통, 교육, 도시 인프라 시스템 기능과 그 지원에 대한 검토도 필요하다. 대한민국 정부는 서울과 수도권을 중심으로한 국가 차원의 신도시 개발 계획안을 수립했다. 연구 개발 산업의 경제 발전, 신 주거 창조 창출, 교통 인프라, 여가 시설을 공급하는 역할을 가지고 있는 동탄과 같은 신도시들은 다양한 지속가능한 디자인 전략을 포괄시키고 이를 이용함으로써 효율적인 주거 지역사회 도시 개발의 기회를 제공한다.

동탄-2: 수리학적(水理學) 배경

남한의 지리는 산악지역과 자연 식생 언덕들로 이루어져 있다. 이와 같은 조건들은 다양한 고도에 연결된 자연 자습지들의 통로와 네트워크를 형성하고 있는 물의 흐름을 영향을 미친다. 동탄(東坦), 동쪽의 평평한 땅을 의미하는 이 이름은 그 지리적 자연환경을 상징한다. 동탄은 여러 수계와 유역들로 이루어져 있으며, 가장 높은 오산천으로 연결되어 있다. 이러한 자연적 특성으로 인해 이곳 토지는 계단식 논으로 이루어져게 되었다. 이러한 토지는 수계의 복잡한 동탄을 시구 농경 사회로 유지시켜 왔다. 우리는 이 농경 사회에서의 계단식 논을 통해 물이 어떻게 보유, 저장, 배급되고 작물 생존에 어떤 영향을 미치는지 알 수 있다. 모든 물의 네트워크는 저장 역할을 하는 산척 저수지로 모아진다. 이를 통해 우리가 동탄-2와 수지역의 물리적 치명을 나뭇잎에 비유 하는 이유이다. 이 비유는 흔히 구조의 조절을 시각화 하는데 도움을 준다. 물의 흐름, 그 형태, 색채들의 모든 형체가 동탄-2의 물리적 지형에 관련되어 있다고 할 수 있다.

대한민국은 세계 다섯 번째 물 수입 국가이다. 수입 물 중 80%는 식량과 농산물 생산에 쓰이며 이중 21%는 수건에 사용된다.

“Each HOUSEHOLD consumes FOUR 18.9 LITER BOTTLES [of natural water] A MONTH on average.”


1. 2007년 UNFPA 세계인구현황보고서
2. 2007년 UNESCO 산하 국제 물환경 교육기관
Rainfall, the major source of natural water, varies drastically around the world. According to the National Rainfall Index, Korea typically receives a relatively high amount of water from rainfall annually, compared to the world average and countries like the USA and China. Yet, the amount of rainfall per capita is surprisingly low in comparison to the rest of the world, as is its amount of reusable water (according to the Reusable Water Index). These factors contribute to an extreme overall water deficiency of 79%, and yet water consumption per capita is very high, more than triple the global average. This combination of low rainfall per capita, low reusability, and high consumption indicates a serious need for water sources. Thus, supply and conservation efforts need to be considered high priorities in any new urban design.

지연수의 주 원인인 강수량은 세계적으로 크게 다르다. 국가간 강수량 지수에 의하면 한국의 연간 강수량은 미국, 중국이나 세계 평균에 비해 상대적으로 높다. 그럼에도 불구하고 인구당 강수량과 재활용수의 양은 세계 평균에 비해 높지 않게도 매우 높다. 이러한 요인들은 극심하게 낮은 물 부족 주인인 79%를 나타내고 인구당 물 소비는 세계 평균의 3배로 매우 높다. 이러한 인구당 적은 강수량, 물의 높은 소비량, 낮은 재활용수 사용량은 어떠한 세 도시 설계에서도 수자원의 필요성의 수요, 물 보전의 높은 우선 순위로 고려되어야 한다.

FAO Statistics, 2008

A Vision for Dongtan-2
The Han River Basin is responsible for supplying water and power to Seoul through a network of power generation dams, dry dams, water filtration facilities, and reservoirs. The North and South Han River join together west of Seoul and become the Han River, which flows through the city and eventually empties into the Incheon Western Sea. Dongtan lies south of the Han River, with the Gyeonggan Stream diverting a limited amount of potable water into the region. As plans to develop these additional urbanized regions are implemented, it is necessary to consider if the entire supply system can sustain an influx in demand from the Han River Basin in order to ensure long-term access to water.

Based on data collected since 1965, the greatest increases in Korean water demand has been due to agricultural and maintenance water use, which is projected to keep rising through 2020.

Korea is the 5th Largest
- Mobile Phone Exporter
- Purchaser of Weapons
- Automotive Manufacturer
- Oil Importer
- Water Importer

한강은 수력 발전, 농, 공, 회사 및 제수지의 네트워크를 통해 서울에 물과 전력 공급을 한다.

남한강과 북한강은 서울 시부에다가 남한강을 통해 편하게 흐르는 나가는 한강이 된다. 동탄은 한강의 남쪽에 위치하고 있으며 경안천의 적온령의 물을 이 지역에 공급한다. 더 많은 도시 계획들이 이행될수록 한강 유역의 전체 물 공급 체제가 장기적으로 어떻게 이 수요의 증가를 다스릴 것인지 고려하여야 한다.

1965년부터 대한민국의 가장 큰 물 수요 증가는 농업과 판매에 의한 증가이며 2020년까지 계속 증가할 것으로 추정된다.
Fluid Zones
Water is the base theme that symbolizes the southern part of Dongtan-2, which is labeled as the Water District. We define Fluid Zones as bodies or networks of water that have a presence within the urban context of public spaces. Fluid Zones embrace the concept of water by utilizing this natural element within the built environment. Such zones would have regulations or guidelines regarding development and proximities, setbacks, and access. Fluid Zones can be constituted by small or large bodies of water. Smaller networks might include wetlands, bio-swales, water streams, collection ponds, or wildlife refuge areas, while the San-Check reservoir is a large element. These waterways would set up baseline parameters for approximate riparian zones.

Dry Zones
Areas that are established through development are defined as Dry Zones. These zones are dedicated to programming and land-use for a variety of categories, which include residential, institutional, mixed-use, commercial, and recreational. Dry Zones would also encompass urban infrastructure such as roadways, landscaping, public spaces, and building structures.

Water Conscious Life Style
Fluid and Dry Zones distinguish the various components of the Water District. The intent is to generate public awareness and understanding of water and the environment. Water can be an abundant natural resource at times, but can also become a scarce commodity. By incorporating water elements within public places, one can educate the public on water usage and conservation methods. In addition, bodies of water can affect the temperature of the area surrounding them, providing a natural cooling effect for bordering public spaces.

"The price of BOTTLED WATER is 9,210 times MORE EXPENSIVE THAN TAP WATER. This is an indication that PEOPLE ARE WILLING TO PAY much more TO GET BETTER QUALITY drinking water."
“78.7 PERCENT of residents rated the QUALITY OF DRINKING WATER as BAD.”

“Concentration of POPULATION AND INDUSTRIES in Seoul Metropolitan Region has given rise to an increasing SCARCITY OF POTABLE WATER SOURCE.”

Target Users and Market Assessment

Dongtan has been designed as one of several satellite cities to Seoul with the intention of identifying itself as a Premier Brand City. For individuals and families seeking new employment opportunities and housing ventures, Dongtan has been marketed as an alternative city for living, raising families, and retirement. Target users consist of educated individuals who are seeking high and entry level employment positions with research and development corporations located in the vicinity. Companies such as Samsung and LG have invested in these research development parks south of Seoul. Dongtan has prospered from this initiative by providing the housing clusters and amenities that attract residents from Seoul. Parallel to this demographic, it has also attracted senior citizens to move away from the massively urbanized city to an environment with less density and larger open green spaces. The youth culture should be noted as part of the diversity of the community demographics. Dongtan-2 is addressing this group with programming for an educational sector that consists of various schools clustered within a common large open space.
Characteized Program and Cultural Destination

Dongtan-2 is envisioned to be a destination center with a variety of programming and amenities designated not only for the residents within the new complexes, but also to attract visitors from Seoul. Currently the area attracts Seoul citizens to travel to Dongtan for its recreational environment and privatized golf country clubs. New programming initiatives such as competitively priced housing, shopping complexes, entertainment venues, open space recreation, and rapid transportation networks make Dongtan an attractive sub-city to Seoul. Dongtan can distinguish its identity as a Premier Brand City by incorporating cultural programming such as Performing Art venues and educational spaces for theater, music, and dance. These venues would provide opportunities for arts groups to flourish at every scale, from community based programs to world-class performances. Such programs can characterize Dongtan-2 as destination center for a rich exploration of culture and the arts. With a 40 minute automotive commute and a planned 20 minute high speed subway system to Seoul, Dongtan-2 will attract a large and diverse population.

Premier Housing Brand and New Housing Typology

The built environment can assist in the establishment of key landmarks that contribute to the identity of place. Urban Design and Architecture can be instruments in molding the character of places with iconic value. Housing is a building typology that consumes large sections of cities compared to other building programs. The public engages and has a stronger connection with their dwellings and residences. A residence is the only place that has claims to individual ownership and a sense of private tranquility. New forms of housing should be developed for Dongtan-2, distinguishing themselves from various other housing complexes within the city landscape. The vertical skyscraper has traditionally been the solution for maximizing density and maintaining cost of construction. The skyscraper can be a solution in the short term, but when evaluated over a longer period of time, studies show that this building form is more costly to maintain, has a high contribution to negative environmental impacts, and contributes to a reduction in social interactions among its residents, producing low to unhealthy living environments. Ideally, other forms of housing and construction means and methods can be pursued with a set of strategies in line with the Dongtan-2 concepts of environmental alignment and harmony.

"The TOTAL VOLUME OF WATER available in 1987 was about
114 billion cubic meters.
42 percent WAS LOST through
SEEPAGE AND EVAPORATION."

“The NEXT DECADE will be a period when the demand for QUALITY WATER becomes the MAJOR CONCERN.”

“66 PERCENT OF RAW WATER [in Seoul] is taken from THE SURFACE FLOW OF THE LOWER HAN RIVER and the rest is delivered from the PALDANG RESERVOIR.”

Urban Design Recommendations

Topography and Land-Use

Grids and Blocks
Pathways and roads constitute the urban typology of street grids and city blocks, defining paths of movement throughout public and private properties and delineating ownership, access and political control. Rather than follow predetermined social delineations, these street patterns should relate to the existing landscape of the site, with special consideration given to existing contours and slopes. If roadways were to follow existing contour lines, rather than working against existing physical constraints, a sustainable approach of "form follows function" would produce superior results while reducing ecological impacts.

Ecological Podium
In order to build an ecologically efficient community, one must understand the historical precedents of the site. Looking at existing practices for property management and land conservation provides key techniques for developing green itineraries in planned communities. Strategies such as using local materials for building assembly, reviewing local systems of water collection and distribution, and understanding local planting material and vegetation to be utilized as green walls and roof gardens, are examples of practices that should be fostered through educational incubation programs. Outsourcing green technology within the proximity of the industrial and manufacturing facilities in Osan can offer the benefits of local economic development while fostering new employment opportunities for nearby residents. The concept of outsourcing to local venues can achieve sustainable development initiatives while also encouraging resiliency in the region's workforce.

Water and Land Boundary
Pathways, movement, transitions, and intersections are concepts that can mediate the boundaries of water and land. Establishment of Fluid and Dry Zones will contribute to identifying such areas of use. These zones will define edges and boundaries of districts. Systems of transportation, such as electric buses, bicycle pathways and monorail, can be a physical link between them. Town centers are the central nodes for the connections between services, which spread and disperse through the various zones within the Water District.

Landscape and Agricultural Use
Existing landscapes and land uses are a source of cues for planned design techniques. Features that are traditional in farmland, such as terraced fields, can be incorporated into new designs. The terraced topography of the rice paddies utilizes an array of conservation techniques related to soil erosion and water retention. This farming technique can be re-invented for public spaces and roof gardens with the notion of storage and containment of water. Water can be collected and used for nourishing outdoor plants and for the maintenance upkeep of buildings. The terraces act as bio-filtering systems for grey water that can be purified prior to release in the Osan water stream. These concepts and strategies can be implemented in a Wetland Conservation Plan.
Site Programming

Identity
Cities evince physical characteristics that symbolize meaning and memory. Identity through form is a concept used by many cities to stimulate activity and interest. Such identity generally consists of cultural exposition that provides unique programming opportunities. Architecture plays a significant role in defining culture through forms and space. Design of these spaces can act as an interpreter and attractor. Definition of identity plays a significant role in the characterization and culture of a city.

Relation with Waterfront
Waterfront properties are unique areas for a diverse range of programs and activities. These locations are typically collection nodes for people, events, industry and housing. Properties within close proximity to elements of water are typically sought after due to the benefits of being near a large open space, such as exposure to the sky, cooler temperatures and comfort zones due to an amassing of trees and water. Waterfront sites are typically important urban spaces that energize street life. The presence of water acts as an attractor for the public to engage in social events. Additionally, the water itself can be programmed for an array of activities. Recreational, cultural and ecological programming can engage the water to be part of the urban activities. Here, floating biofiltration rafts serve a dual purpose of maintaining the reservoir’s ecosystem and providing recreational interaction with the water in the form of a semi-private, rentable raft. Visual connections, access, circulation and programming are essential elements in activating waterfront sites. Ample spaces between building fronts and the waterfront edge are necessary in defining this space for the public realm. Continuous circulation along the water’s edge is of great importance for undisrupted programming and activities along the waterfront.

Eco-Edu Corridor
The Eco-Edu Corridor, part of the current proposal for Dongtan-2, is a 7 km north-south green axis that links the major parks, waterways and recreational golf clubs. This corridor would provide a central green space for the city, and be an organizing link between schools, community facilities and residential areas. In this proposal, it is suggested that the Eco-Edu Corridor not just meet and cross the Songbang Stream, east of the reservoir, but instead, that it bend and meet the waterfront recreation area at the San-Check Reservoir. This path allows a direct, natural connection for education and community centers to access the facilities at Performing Arts Center, and engages the reservoir as a unifying, focal point for the Water District and Dongtan-2.

대상지 프로그램

경제성
도시와 전조들은 의미와 기억을 담는 물리적인 특성을들 지닌다. 경제성의 개념은 여러 도시들이 생활 환경을 화려하게 하고 표현하는 한 방면이다. 이러한 경제성들은 보통 문화적 표층을 포함하며 특정있는 프로그램의 기회를 제공한다. 건축은 환경과 공간을 통해 문화를 형성하는데 큰 역할을 한다. 이자는 건축 기능을 이용하고 매력적인 공간이 될 수 있으며 ‘광고’로서의 도시의 경제성에 대한 정의는 그 도시의 특성을 통해서도 마련할 수 있다.

워터프레트와의 관계
워터프레트 대지와 건물들은 프로그램과 여러 활동이 혼합된 특별한 구역이다. 대지의 경우 이런 장소는 사찰, 이벤트, 산업 및 주택들이 집중되는 곳이다. 수변공간에 가까운 부대공간들은 수요가 많음을, 이는 물론 오픈 스페이스와 화려한 트임을 지향적 특성과 주변 주택들이 공용하는 점은 외부 환경의 정점에 때문이다. 워터프레트는 거리에 활력을 더하는 중요한 대표적 장소이다. 물의 존재는 대중이 사회 이벤트에 참여할 수 있는 기회를 갖고 있는 역할을 하고며 현재로서는 물 자체가 여러 활동으로 프로그램될 수 있다. 여가, 문화 및 생태학적 프로그램은 물이 도시 활동의 한 부분이 될 수 있도록 해준다. 예를 들어 동탄-2의 바이오필터 백록들은 저수지의 생태계를 보존해야 할 만큼이나 물을 정净하는 대책 활동을 제공한다. 워터프레트 대지를 활성화하는데 있어서 시각적 연결, 워터만, 동산 및 프로그램이 중요한 역할이다. 관들과 워터프레트의 가장 끝자락 사이에는 충층한 공간 확보가 중요하며 이는 이 공간들이 공공 공간으로서 역할 할 수 있기 때문이다. 워터프레트의 클립없는 연결성은 단절없는 워터프레트의 환경과 프로그램 구성에 아주 중요한 역할을 한다.

이코-에듀 코리드어
이코-에듀 코리드어는 7km의 남북축으로 이루어져 있으며 주요 공원, 수로 및 여가 골프 공간을 연결하고 있으며 현 동탄-2 설계안에 포함되어 있다. 이 코리드어는 도시의 중심에 놓적한 케이션으로 교육, 지역 사회 시설 및 주거를 연결한다. 이 설계안에서는 이코-에듀 코리도어가 저수지의 동쪽에서 단순히 용량을 만족하고 전개하는 것뿐이 아니라. 이 이코-에듀 코리도어는 산책거리지 워터프레트의 여가 공간을 관리적이며 많은 기회를 만들 것이다. 이 같은 교육과 지역 사회 센터가 공연 예술 센터와 자연스러우며 직접적인 연계를 제공하여 산책거리를 통한 수 지역의 통합적 중심 조성이 되도록 도와 준다.
Performing Arts Center (PAC)
Cities provide venues for performances and exhibits of cultural influence and activity. Such programming can be displayed through a Performing Arts Center (PAC). PAC can act as a cultural anchor, housing a variety of spaces and providing venues for local community arts programming and education, as well as world class showcases. PAC can attract an audience not just within the Dongtan-2 extents; it has the capability of being a regional cultural institution attracting visitors from the main city of Seoul. PAC can comprise various programmatic venues: an indoor enclosed theater, indoor/outdoor roof covered seating area, outdoor lawn, and the reservoir lake of San-Cheok. These four diverse environments allow for a wide range of activity options within PAC, while together forming the core identity of the Dongtan-2 water district.

The concept behind the relationship of the Dongtan Performing Arts Center (PAC) to Seoul can be seen in a similar relationship between the Bethel Woods Center for the Arts and New York City. The Bethel Woods Center provides a variety of lush natural settings for concerts, festivals and performing arts, 90 minutes from the urban center of New York. Incorporating state of the art performance space technology with sustainable landscaping systems, the Bethel Woods Center celebrates nature and local site history along with world renowned arts and performance. This use of natural landscape for a variety of indoor/outdoor performance space is a model for PAC, which can offer the same type of expansive, inviting and iconic arts spaces for the residents of Dongtan and Seoul.

Korea Institute of Design Thinking
Dontan Regional Performing Arts Center

동탄 광역 공연 예술센터

SITE PLAN

1. STAGE
2. UNDERCOVER SEAT
3. OUTDOOR LAWN SEAT
4. RESTAURANT / CAFE DECK
5. CONCERT HALL
6. PERFORMING ART EDUCATION CENTER
7. PUBLIC SERVICE CENTER
8. WATER PARK
9. PUBLIC ART SPACE
Infrastructure

Nodes, Circulation and Connections
Dongtan-2 is clustered into various themed districts such as Techno, Light, Future, Art & Design, Park, Culture, Color and Water. Each district will have its own city core or town center, which together act as urban nodes for the city’s network. These points connect to other centers within the various districts by means of transportation systems. The notion of nodes, circulation and connections are of importance, as they define the foundations for networked support systems. These systems of transportation for goods and people, as well as for energy, water, and communication, must be integrated within the concepts of infrastructure and distribution.

Patterns
Patterns play an important role in urban life, and are necessary in creating a functional and user-friendly infrastructure system. Patterns allow people to understand collective rhythms of movement, and can provide interplays of order and logic with beauty and complexity. Transportation provides an opportunity to layer the paths of the system into a complex set of options for experience — by considering the means, pathway, speed and visual access of the many types of transport.

Landmark, Vista and Focal Points
The Water District for Dongtan-2 has a unique feature within Dongtan, as it contains the only full body of water, the Sancheck reservoir, within its site boundaries. One can envision the reservoir as the focal point of the district, with all landmarks and vistas having either a direct or metaphoric connection to this space. View corridors, pathways, trail lines, streams, and green corridors can be utilized as elements to maintain this connection while traveling within the district. These connections then serve as tools for orientation and direction, guiding experiences through the public realm.

인프라

결절지점, 순환, 연결성
동탄-2는 테크노, 빛, 미래, 예술 및 디자인, 문화, 색채 그리고 물 등 여러 테마로 이루어져 있다. 이 지역들은 각 지역별로 각 도시의 결절지점 역할을 할 도시 중심가들을 포함하며 도시의 네트워크가 된다. 이 지점들은 교통 체계를 통해 다른 지역들과 연결된다. 결절지점, 혼란 및 연결성의 개념들은 그 네트워크의 보조 체계들의 기본 개념이 되므로 중요하며, 사람과 물류의 수송, 에너지, 물, 통신체계등의 요소들은 인프라 및 분배의 개념 안에 통합되어야 한다.

패턴
패턴은 도시 생활에 매우 중요한 역할을 할 것으로 기능하며 사용이 필요한 인프라가 체계가 필요하다. 패턴은 사람들이 도시의 움직임과 관람하도록 도우며 경사, 높이, 복합성 및 아름다움을 논할 수 있다. 운송 수단은 통로, 속도, 시각적 길과 여러 운송 수단의 선택을 통해 여러 경험이 기회를 제공한다.

랜드마크, 전망, 중심지
동탄-2의 수(水) 지역은 경제전 안에 산 전체수를 포함함으로써 다른 동탄 지역들에 비해 특별하다. 이 지역들은 랜드마크들과 전망들이 직접적이며 은유적인 의미있는 설치를 통해 상호 연결된 중심지로서 제공될 수 있다. 전망 코리도어, 도보, 산길, 개천, 녹지 코리도어들은 구역들 안을 지나며 서로 연결하는 구성요소로 사용 될 수 있다. 이는 주민이 공공 공간을 통해 방향과 위치를 인지하는 도구가 될 수 있다

“if each LOCAL GOVERNMENT CONSTRUCTS its own RAW WATER TRANSPORTATION pipeline to the water source, CONFLICT WILL ARISE BETWEEN upstream and downstream users and between LARGE AND SMALL CITIES.”

Design Guidelines

Sustainable Planning Strategies

The following categories describe concepts for planners and designers to consider as part of the project development process. Use the following list as a guide for evaluating how the proposed design complies with the Dongtan-2 conceptual framework.

Water and Wastewater Infrastructure
New developments should be located in or near existing inhabited communities. The goal is to conserve and maximize undeveloped virgin areas while controlling the growth of urban sprawl. Consider the environmental impact of the proposed design as it relates to water. Identify the source, required quantity and availability. Identify and highlight aspects within the project that can utilize storage of water from rainfall, roof ponds, surface runoff and storm water collection. Develop a strategy for these collection systems to reduce the demand of water from the municipal service line. Consider the expenditure of waste water. Develop a design than can reuse, recycle, and filter the consumed grey water. Develop an infrastructure that can be implemented with grey water by reusing it within the building systems.

Wildlife, Species, and Ecological Community Protection
Identify existing wildlife species or ecological sanctuaries that would be affected by the proposed design. Develop a conservation or protection plan as part of the proposal. An alternative method would consist of designing a new habitat environment within the design. Explain how the alternative would meet or exceed the ecological environment that exists.

Wetland Conservation Plan
Identify areas within the design that would conserve and protect existing wetland conditions. Display how such areas can be part of the water-based infrastructure, showing how they relate to conservation of water, water quality, natural hydrology and biodiversity.

Floodplain Protection/Prevention
Develop a floodplain mitigation plan for the protection of people and property. The protection plan can relate to the wetland conservation strategy as it enhances water quality and natural hydrology systems. Define an area or dimension from the water’s edge that maintains a buffer or no building zone.

Encouraging Mass Transportation
Locate zones or areas where access to mass transportation systems can be provided. Verify that these points are located at a maximum 20 minutes walking distance from the location.
Bicycle Networks
Develop a master plan for a bicycle transportation network that would support its usage, service and storage. Implement parking and storage of the bicycles on the public walkways and at the entrances and internal cores of buildings. Incorporate support systems such as air pumping stations and potable water fountains as part of the plan.

Employment and Housing Proximities
Identify the walking proximity and environment between residential communities and employment areas. Determine if such connections between land uses can define walkable distances within the urban plan. Encouraging pedestrian movement as a means of daily transportation would reduce energy consumption derived from the dependence on fossil fueled motor vehicles and increase healthy activity.

Erosion Protection Implementation
For sites and areas with extreme conditions that exceed 15% in slope, establish an erosion protection plan to mitigate the impact of toeoll lose from site disturbances and harsh weather patterns. The intent is to protect existing habitat and the natural water systems.

Proximity to Educational Facilities, Eco-Corridor and Institutions
Identify the walking proximity between residential communities and places of learning. Determine if such distances between land uses help define walkable distances within the design. This objective would develop healthier communities by encouraging the public to be physically active and reduce dependency on usage of a private automobile.

Diversity of Housing Types
Develop a master plan that incorporates an array of housing types with a variety of building plans and massing structures. Such types must consider the use of young, middle aged and senior citizen demographics. Mixed-use buildings, multiple scales and including a variety of architectural types and characteristics are strategies for creating diverse community experiences and unique visual textures.

Reduced Parking Footprint
Minimize the parking requirement as traditionally implemented in new development plans. Reduce or eliminate on street parking spaces and utilize such areas for public use. If private vehicular storage is part of the program, locate such spaces underneath the building footprint or in the rear of buildings. Maintain the footage of the buildings for public and commercial usage. Alternatively, develop a parking facility cluster located at the edge of the development or near the vehicular expressway system.


csjnagc neardsvork
자전거 네트워크
자전거의 사용, 보관, 서비스를 지원 할 수 있는 자전거 교통 운송 마스터 플랜을 개발한다. 자전거를 건물 입구, 건물 내부 및 공공 보도에 보관, 주차할 수 있게 한다. 공기 주입 장치나 휴대용통을 제공할 수 있는 시스템 등의 체계를 계획한 일부로 구체화 한다.

고용과 주거지역
주거와 교통 환경 사이의 균형성을 확보 하고 이들 사이가 계획안에서 보행 가능한 거리인지 확인한다. 일상 생활에서 보행을 운송수단으로 장려한다면 화석 연료에 의존하는 자동차들의 에너지 사용을 줄일 수 있을 뿐만 아니라 시민들의 건강한 온실적 활동을 증가 시킬 수 있다.

침식 방지와 적응
15% 이상 경사지에는 겉으로 호우로 인한 침식이나 토양 유실을 최소화 하는 방지 방안을 마련한다. 그 목적은 기존 자연수계체와 생태 환경보호에 있다.

교육기반, 공공 기관 및 이코-여두 코리도어의 균형적 주거 지역과 교육 기관들의 보행 균형성을 파악하고 이들 사이가 계획 설계안에서 보행이 가능한 거리인지 확인한다. 이는 주민의 육체적 활동을 장려하고 자가용에 의존도를 줄임으로써 건강한 지역사회를 만들는데 일조를 한다.

주거단지들의 다양성
주거의 구조, 평면 및 매소가 다양한 마스터 플랜을 개발한다. 유소년, 중년, 노인층의 사용에 따른 다양성은 물론 고려되어야 하며 다양한 건축 양식, 개성, 혼합 건물 및 여러 크기의 건축은 다양하며 독립한 지역 사회 형성 전략이다.

주차단지의 축소
새 지역 개발에 전통적으로 적용되는 주차 면적을 최소화 한다. 거리에 주차 공간을 줄이거나 없애고 이 공간은 공공 용도로 사용한다. 만약 주차장이 프로그램의 일부분이라면 주차장을 건물 지하나 터면에 배치한다. 건물의 지하층은 공공이나 상업용으로 이용하라. 대신으로는 개발 지역의 경계면이나 고속 운반 체계에 근접한 곳에 주차장 클러스터를 개발한다.
Encouraging Walkable Communities
Design the public street to encourage walkability. Implement public street furniture and develop a tree-scaped plan. Utilize this strategy to encourage the habitants to walk between work, retail, and recreational spaces. By encouraging physical activity, one is promoting public health while reducing energy consumption derived from dependence on fossil fueled motor vehicles.

Urban Heat Island Effect Management Plan
Conventional streetscape materials utilized for civil design contribute to high temperatures in the public space. Traditional materials such as concrete, asphalt, metals, and materials with high Albedo ratios have contributed to this urban phenomenon. Utilize vegetative features and strategies that contribute to the reduction of the environmental temperatures. Develop a tree-scaping plan within the design. Allocate areas for vegetative planting opportunities. Reduce the amount of asphalt utilized in road construction—supplement with porous green pavers that permit the growth of vegetation within the openings. Utilize materials that have a lower Albedo ratio.

Storm Water Management Plan
Reduce the impact of surface runoff and maximize ground water recharge attributed to typical new development patterns. Develop a management plan that would minimize the surface runoff of rainwater within the watershed boundaries. Identify collection points and areas to accumulate water for use in building and public works. Strategize for onsite, micro water treatment facilities within the development.

Solid Waste Management Plan
Along with density and high population in cities, solid waste management becomes an issue of concern that is typically overlooked. Develop a plan that would assist in reducing the waste footprints traditionally produced at the household scale. Identify points and areas for the recycling of materials such as glass, paper, aluminum and plastics. Locate distribution centers for the submission and removal of overspill items such as carpets, building materials and furniture. Verify a strategy that can minimize the impact of waste submission into landfills or for incineration.

Reduction of Carbon Emission
Urban areas have historically been sources of increased temperatures within the surrounding environment. From surface building materials to mechanical air conditioning equipment, these items have been identified as sources for the increase in outdoor temperature while contributing to green house carbon emissions. Identify in the plan what strategies or solutions the design can incorporate to assist in reducing carbon emission to the environment.

Reduction of Light Pollution
City cores and urban areas have implemented a variety of architectural lighting applications to enhance afterhours nighttime activities. This trend has resulted in a greatly reduced visibility to the night sky. Define how the design would impact this on visual night sky accessibility. Identify the reduction of lighting features implemented in the public spaces.
Water Management Systems
Conservation and collection are concepts with the goal of minimizing the use of natural water. See the recommended approach under the Storm Water Management Plan in the Sustainable Planning Strategies section.

Transport Systems
Reduction in the use of privatized fossil fueled vehicles and enhancement of mass transportation options can contribute to sustainable community planning. The goal is to reduce the dependency of traditional Peak Oil dependent communities and design a system where use of fossil fuel consumption can be minimized. Addressing the transportation sector can reduce fuel consumption dramatically. See additional information under the Patterns description in the Infrastructure section. Additional information can also be found in the Encouraging Mass Transportation and the Bicycle Networks description in the Sustainable Planning Strategies section.

Energy Systems
A strategy for developing self-sustained and resilient communities is to produce their own sources of energy internally. Incorporating technological systems such as solar panels, geo-thermal heat pumps, and Micro- co generators is one set of strategies to achieve self producing energy development with an upfront cost constraint. Alternatively, one can use design as a tool to achieve energy saving initiatives. As an example, incorporating Solar Passive design strategies is one method to reduce energy consumption in buildings. In the design, verify how energy strategies can assist in developing a low carbon model for energy reduction.

“It is projected that INCREASING WATER DEMAND will mostly be met by constructing new multi-purpose dams. RESERVOIRS will provide nearly 40 PERCENT OF total SUPPLY.....GROUND WATER will remain a MINOR SOURCE [of supply], as there are no large aquifers in South Korea.”

Zones

Fluid Zones
Within the design, outline this boundary which is located parallel to the San-Cheok Reservoir. Define a public zone from building front to water’s edge that would include program uses such as wetlands, public parks, walkways, bike paths, etc. Determine how the design would distinguish the waterfront from the other zones. Use the referenced description of Fluid Zones in the Dongtan-2: An Alternative Approach to Waterfront Urbanity section. Also see the Relation with Waterfront in the Programming section.

Dry Zones
A Dry Zone has certain characteristics which distinguishes it from a Fluid Zone. Conceptual themes such as elevation, terraces, highland vegetation and interactive water elements can be used to bring attention and connection to water systems when not in direct contact with a natural waterway. Use the referenced description of Dry Zones in the Dongtan-2: An Alternative Approach to Waterfront Urbanity section.

Waterfront Zones
The San-Cheok Reservoir is the center core of the Waterfront Zone. All visual sightlines and elements direct to the reservoir. Regarding the definition of Dongtan, “eastern shallow,” San-Cheok is the physical representation of the meaning. The vision of this body of water is to host public programs, demonstrations and venues for local residents and visitors. In the design, identify the programming strategy of such uses and the relationship between the master plan and water activities.

Community Zones
The overall Water District is composed of the several zones listed above. Each zone would have a center point of orientation for community purpose, defined as Town Centers. These are the meeting places for locals to travel towards and obtain goods and services utilized in everyday life. Retail stores, offices, common services and connections to transportation are integral to the town centers. The goal is to have a multitude of these cores throughout the zones which can be accessible by walkable means, as well as by means of a sustainable transportation system such as mass transit bus, light rail or monorail. Use the referenced description in Water & Land Boundary in the Topography & Land-Use section.

Parking Zones and Mass Transit Hubs
Movement and flows of people are an important element to the functionality of cities. The relationships and connections between places of living, work and recreation play an important role in successful living environments. These elements should be emphasized and developed in the design as distance, time and efficiency are fundamental design concerns in community planning initiatives. In the design, identify how such concepts are distributed within local and regional transportation planning. Use the referenced description in Nodes, Circulation, Connections in the Programming section.
Buildings

Architectural Landmarks
Architecture plays an important role in the identity and characterization of cities. Design can empower the symbolism of spaces while exemplifying quality and care for the users. Articulation of form and space while selecting the appropriate materials can achieve good design practices for livable community standards. It is of great importance that the master plan compiles such applications and displays a contribution towards sustainable practices and design excellence.

Street Frontage & Public Active Spaces
The public realm is an important element which generates life and activities for cities. It is of great importance that such areas are activated to stimulate street life. Location of building entries, active street grade storefronts and accessibility are vital in providing active public spaces. Public space infrastructure such as street furniture, landscaping, information terminals and public parks assist in this goal. In the design, identify typical views at the human scale by visualizing the various points and districts from an alternate vantage point.

Public Art & Interactive Exhibits
Information, entertainment and education are stimulating ways of engaging the public with new ideas, research and cultural expositions. The utilization of public art installations, graphics, and interactive media kiosks has been shown to enhance the experience of public places for the users, as well as encourage the spread of information. Use such techniques to engage the public with the idea of water and define how such applications can relate to the themes of conservation and environmental responsibility.

[Images and diagrams related to architectural components and process flow]
건축물

건축적 랜드 마크
건축은 도시의 개성과 독특성에 큰 역할을 한다. 디자인은 공간 사용자를 배려 하고 통학을 전시함으로 동시에 장소의 상징성을 표현할 수 있다. 적절한 재료들을 선택한 평면화 형태와 공간들은 살만한 지역사회의 좋은 디자인 판례가 될 수 있다. 마스터플랜도 이런 결합들을 따르고 우수한 디자인과 지속가능한 실무에 기여하는 것은 매우 중요하다.

거리 프론티지와 공공 활성화 공간
공공 영역은 도시의 핵심비구가 생명을 만드는 중요한 요소이다. 이러한 영역들이 활발한 거리 문화를 위해 활성화 되는 것은 매우 중요하다. 건물의 입구나, 활발한 가게들 및 접근성을 공공 장소를 제공함에 있어서 더욱 중요하다. 가로시설물, 조경, 건물 터미널, 공원 등의 공공 인프라라는 것을 보장한다. 실제로 힘들 때는 인간 적도의 시야에서 대표적인 장소들을 다양한 각도에서 시각화하고.

공공 예술과 상호작용 전시
정보, 교육, 교육은 주민들이 새로운 아이디어, 연구, 문화 전시에 관심을 갖게 하는 자극 요소들이 다. 공공미술, 그래픽, 인터랙티브 미디어 전시 및 키오스크의 이용은 주민들의 공공 장소의 체험을 향상시키며 정보전달도 충진한다. 이러한 기법들을 이용해서 주민들이 물의 개념에 동참하고 환경 보존과 환경적 책임감을 갖게 할 수 있는지 명시한다.
The concept of "green roof" is expanded to fully wrap the housing units in Dongtan-2. These green bands serve multiple purposes - both shading the units from hot sun in the summer and providing natural air purification - converting carbon dioxide naturally into oxygen. The roof becomes "blue" - serving as a water container and filter for the community's water supply.

그런 지붕 개념은 동탄 신도시 2기 전체 주거단지에 확장 적용될 것이다. 이러한 녹색 지붕의 주요 기능은 트라이앵글로부터 자연 그늘을 제공하는 것 외에도, 자연 공기정화 기능도 가진다. 또한, 지붕은 벼룩을 막아 저장하고 접수함을 통해 제공하여 전체 지역 주민들에게 깔끔한 물을 제공하는 "블루" 지붕으로서의 기능도 가짐이 된다.
References and Case Studies

Water and the Future of Cities

Water is integral to our cities and our health, and cities have developed several strategies for utilizing it to enhance our daily lives. Urban areas with waterfront access have a unique opportunity to provide residences with a chance to interact more closely with this important resource. The parameters of inland reservoirs and ponds often define urban parks, which can include running paths, grassy picnic areas, diverse horticultural cultivation, and large social recreation spaces. When bodies of water provide homes for wildlife, they allow people to become familiar with a local subset of animal and plant life - a valuable educational experience for residents who live primarily in these urban environments. Pathways designated for running, walking or biking encourage healthy recreational activities which can positively affect the physical and mental health of the city residents. Cities on an ocean or river waterfront often develop dynamic strips along their coastlines, as the waterfront provides an opportunity for transportation (ports and ferries), recreational water activities and visually stimulating natural vistas.

Water also plays a necessary role in the daily functioning of our cities, brought in naturally by weather patterns as well as controlled through many layers of plumbing and piping infrastructure systems. In our homes and work, access to clean, potable drinking water is critical to our health and sanitation, as is an effective sewer system for waste collection, treatment and disposal. Decorative water elements such as fountains can act as focal points for recreational public plazas, as well as provide comfort zones with airborne water mist during hot weather. Fountains pumped with potable water provide hydration to the public. When weather patterns do not provide enough water to nourish vegetation and agriculture, irrigation systems bring water to the needed areas. When precipitation is heavier than cities’ systems were built for, emergency water management plans are required to control flooding, property damage, and overwhelmed sewers. Used for nourishment, cleaning and recreation, water is paramount to our survival and we must take measures to responsibly manage its use and treatment.

参考, 사례 연구

도시의 물과 미래

물은 도시의 건강의 일부분이며 도시는 물을 이용해 일상 생활을 향상시키는 여러 전략을 개발했다. 워터프론트에 접근이 용이한 도시지역은 주거인 것이 중요한 자원과 더 가까이 상호 작용할 수 있는 특별한 기회를 부여 한다. 소평 간디 지역, 리스 본, 윌리엄 재배, 많은 사회 여가 공간 등을 포함한 도시 중심의 경우 더욱 저수자 및 물의 존재가 그 경계를 정하는 경우가 많다. 물은 아생에 주거지를 제공하며, 그 지역의 동식물과 천연해질 기회와 주로 도시화에 따른 주민들에게 적합한 교육적인 경험을 제공한다. 건강, 레저 및 자연경을 위한 보도는 주거인의 정신 및 육체 건강을 증진하고 있는 건강한 여가 활동을 장려 한다. 따라서 강의 워터프론트에 위치한 도시들은 주로 워터프론트가 운속(항구 및 연락선)이나, 여가 활동 및 시각을 증진하는 자연 정관의 기회를 제공하면서 이전처럼 자연의 건강을 보호하는 기회를 제공한다.

물은 자연적 날씨나 인위적으로 조절되는 배반 및 급변수 인프라 체계를 통해 일상 생활에서 필요한 역할을 한다. 하녀가 일가리에 깊은 식수 공급은 효과적인 하수 처리나 세수 수집, 처리 및 재활용과 함께 우리의 건강과 풍부한 물을 위해 매우 중요하다. 자연적인 물 요소들은 공공 여가 공간의 중심 조건이 될 수 있으며 더 복잡한 농업과 물 안개를 통해 많은 건강한 공간을 창조할 수 있으며 식수는 대중의 강점을 해소 한다. 달쳐가 식물이나 농사에 필요한 충분한 물을 얻는 것이 또한 때에는 관광 체계가 필요한 부분에 물을 공급하여 강수량이 도시의 실제 안개를 닦아내는데, 홍수 조절, 재정 보호 및 범위는 하수의 조절을 위한 긴급 사태 관리 체계가 필요하다. 우리는 영상, 철학 및 여가를 제공하며 우리의 생물에 가장 중요한 물을 책임있게 관리 및 취급하도록 행동을 취해야 한다.
Water and Urban Infrastructure: Cheonggyecheon

The Cheonggyecheon stream restoration, recently completed in central Seoul, provides a timely example of the benefits that integrated waterways can bring to urban life. Here, a historically attractive natural stream had deteriorated into a polluted waterway, and had been since covered in concrete, hidden beneath the city. The recovery actions uncovered and revitalized the stream, bringing forth a clean, healthy ecosystem that runs about three miles through the city with recreational walkways along its banks.

The Cheonggyecheon is visited by approximately 90,000 pedestrians each day. The recovery project has brought economic benefits to the area with increased property values, and researchers have documented dramatic increases in wildlife species diversity, temperature control and air quality. A natural refuge in a city of ten million, the banks of the Cheonggyecheon are a valuable precedent for the wide range of benefits that come from reintroducing natural elements into an urban setting.

물과 도시 인프라: 청계천

최근 서울 한복판에 복원된 청계천은 시기 적절하게 통합된 수로가 도시 생활에 가져올 수 있는 이득의 예를 보여준다. 역사적으로 매력적이었던 자연천이 오염된 수로로 변하고 콘크리트로 덮였으며 도시 밑으로 사라졌었다. 이 복원 사업은 개천을 노출시키고 환경화하며 도시 속에 3마일에 걸친 녹색길에 개竃하고 건강한 생태 체계와 여가 도보를 제공한다.

청계천은 하루에 대략 90,000명의 보행자가 방문하며, 이 복원 사업은 부동산 가격의 상승을 통해 이 지역에 경제적 이득을 가져왔으며, 연구원들은 극적인 야생동물 다양성 증가와 온도 조절 및 공기질의 상승 효과를 보고 했다. 현대 도시의 자연 도피처로 청계천은 도시에 자연 요소를 소개함으로써 넓고 다양한 이득을 가져온 가치있는 체계이다.
Urban Typology: Comparison of High and Low Rise Apartment Buildings

High density residential buildings offer great opportunity to implement sustainable design practices at a large scale. Yet, with this opportunity comes the responsibility of careful and thorough analysis of the proposed building's lifecycle. In this example, we compare a residential tower typology with a low-rise in regards to costs and water usage over a 15 year period. At the time of construction, the tower seems financially appealing, costing half the price as the low-rise but using double the sources of water.

Over the 15-year period of typical high-rise modifications and alterations, we see that the initial financial savings in the tower construction do not last. In the typical scenario, water usage and costs increase steadily over the lifetime of the tower, while green space diminishes. In contrast, the low-rise complex requires less modification and costs less to maintain at the end of its lifecycle. Its water use remains steadily low, and green spaces are allowed to flourish. At the end of 15-years, the low-rise has less than half of the total financial and environmental costs of the tower. These results point to the need for upfront, in-depth evaluation of our designs, with an intent to identify the best investments over the entire lifecycle of the projects, and cities as a whole.

In addition to making sustainable environmental and financial investments with our building typologies, we must also look at the social, safety and lifestyle effects in our design choices. In a "tower on a base" scheme, social and safety concerns are high, as are the long term costs. In comparison, the low-rise "contextual building scheme" may have somewhat elevated concerns in the density category, but provides more opportunity for social interactions, safety and long term financial stability.
도시 유형: 고층건물과 저층건물의 비교

고밀도 주거 건축은 지속가능한 설계 원칙을 널리 적용할 수 있는 좋은 기회다. 그러나 이 기회는 건물 수명주기를 조심스럽고 면밀하게 분석할 책임이 함께 따른다. 이에 대해서는 주거 고층 타워 유형과 저층 유형의 경제적 비용 및 물 사용을 15년째 겪어 비교해본다. 시공 시기에 고층 타워 유형이 저층 유형에 비해 비용이 절반으로써 경제적 대형적이어서 보이지만, 두개의 문을 사용한다.

이것의 15년에 걸친 변경과 개조를 통해 초기의 비용 절감이 남지 않는다는는 알 수 있다. 전형적인 예로, 물 사용과 비용은 증가하고 녹지 공간은 감소한다. 이에 반해, 저층 건물은 변경 및 개조가 덜 필요하며 수명 주기 끝에서 보면 유지 비용이 적게 든다. 물의 사용량은 지속적으로 높아지고 녹지가 늘어나지 않게 한다. 15년 수명 주기 끝에서 보면 저층 건물은 고층 타워에 비해 경제적 및 환경적 비용이 절반이다. 이런 결과는 초기 투자의 필요성, 설계의 세도 있는 평가, 전 도시와 프로젝트의 전체 수명주기를 고려한 최고의 투자를 고려하도록 한다.

우리는 설계 선택을 할 때 지속가능한 환경과 경제적 투자가 이외에 사회, 안전, 생활 양식의 영향도 고려 하여야 한다. “기반 위의 타워”는 경제적 비용뿐만 아니라 주민의 안전성 및 사회적 측면에 우리를 야기한다. 이에 비해 “배경적 건물 계획”은 연구 빌딩 측면에서 유지가 필요는 있지만 높은 안전, 사회 교류의 증가나 장기적인 재정의 안정성의 기회를 제공한다.
Conclusion

Sustainability is not a single rule, concept or technology - it involves taking a wide and critical look at the systems being implemented on a particular landscape and making well researched decisions for long-term environmental and human health. The guidelines in this publication have been established with the goal of providing architects, planners, urban designers and policy makers with a comprehensive overview at the significant areas where sustainability must be considered for the long term physical and economic health of our cities. As continuing population growth is leading to the establishment of new urban communities, it is necessary to minimize impacts to the remaining natural environment while maximizing quality of life and economic feasibility for residents and visitors.

By establishing a methodology rooted in research and understanding of a site's ecology, history and precedents of land-use, designers are encouraged to consider the unique properties of their site as the guiding principle for their designs. The methodology also includes careful consideration for the needs and goals of the target users in the new urban site, as well as for the city and country as a whole. In this case, Dongtan has the opportunity to achieve sustainability, not only environmentally, but for itself as an urban system and worldwide brand. The design and strategies presented in this publication display an alternative method in town planning design, where environmental conservation plays a fundamental role in new development. The proposed scheme offers multiple benefits, with integrated techniques that would facilitate cutting the development cost of a conventional planned design approach by half.

By integrating principles such as education, conservation and alternative transport into the urban fabric, Dongtan can remain healthy and affordable long after its initial establishment. Within the planning guidelines, strategies range from implementing techniques of conservation to encouraging alternate behaviors through access and education. Water-based infrastructure, wetland conservation, floodplain protection and erosion protection are all techniques which can both reduce city costs and preserve ecology. Protection of wildlife species is essential as populations spread, and the integration of plants, animals and natural habitats throughout cities attract people to public spaces and provide educational opportunities for residents. The selection of materials for building and lighting in new city development is a chance to drastically reduce impacts related to climate change, such as the Urban Heat Island Effect and light pollution. These guidelines together encourage a holistic look at our cities and environment - both of which benefit when working together.
Project Team

Richard Plunz is Professor of Architecture at Columbia University where he directs the Urban Design Lab at The Earth Institute and the Urban Design Program at the Graduate School of Architecture, Planning, and Preservation. He is considered one of the world's leading authorities on urban development. He is the author of many books, articles, and studies. His books include A History of Housing in New York City, 1990, The Urban Lifeworld: Formation, Perception, Representation, 2002 (with P. Madsen), Eco-Gowanus: Urban Remediation by Design, 2007, (with P. Culligan), and most recently Urban Climate Change Crossroads, 2010 (with M.P. Sutto).

Richard R. Gonzalez is an architect and an urban designer. A native of New York City, he is Project Manager at the Urban Design Lab where he is working on issues affecting the urban environment in New York City and abroad. He has a deep knowledge of successful community-initiated projects in New York City. He has been the recipient of the Mathew W. Del Gaudio Award for Excellence in Total Design in 1999. He is a LEED® Accredited Professional with the United States Green Building Council.

Leo Daehwan Chung holds a Master of Architecture and Urban Design from Columbia University (2008) and B.Arch from Chungang University in Korea. He worked in Seoul at the Center for Architecture and Urban Design and with Balconi Architects and John Reed Architecture in New York City. During his studies at Columbia he focused on waterfront revitalization and urban sustainability. He has been involved in projects at diverse scales, gaining professional experience in both architecture and urban design.

Maria Paola Sutto is a biologist and a journalist. Her research relates to complex variables at the intersection of disciplines: from ecological science to social science, from economy to art and architecture. She is engaged in finding creative organic solutions to complex contemporary challenges. She has written extensively for the Italian media (Bravaiitalia, Multimedia, Galliver, Teknos, Prima Comunicazione). In her recent book Urban Climate Change Crossroads, 2010 (with R. Plunz), she explores a new generation of thinking necessary to transform our global ecological challenges.

Tong Hao graduated with a B.A. in Art History and Visual Arts and a Certificate in Architectural Engineering from Duke University. He is currently completing a Master of Architecture degree at Columbia University. He has been the winner of the Caroline Bruzelius Gothic Cathedral Design Competition. Tong has a strong interest in architectural design as a cross-disciplinary medium.

Dongse Kim is an architect and urban designer from Wellington, New Zealand. He was born in Seoul, Korea and was educated in Dubai, Seoul, and Wellington. He completed the Master of Architecture and Urban Design at Columbia University (2009) after studying architecture in New Zealand. Prior to moving to New York, he worked on three regional and national award-winning projects while practicing at CCM Architects. He also taught at Victoria University in Wellington. He is a registered architect with the New Zealand Registered Architects Board (NZRAE).

Marc Leverant recently graduated with a Master of Architecture from Columbia University (2010) and received his B.A. in Architecture at Clemson. His work has been published in Metropolis and I.D. Magazine, and he has exhibited internationally at the Venice Biennale, the Beyond Media Festival in Florence, Italy, the International Contemporary Furniture Fair in New York, and the New Center for Contemporary Art in Louisville, KY. His team was awarded the Metropolis 2007 Next Generation Design Competition Runner-Up for the design of a pollution, light, and sound absorbing barrier system for highways.

Zoe Malliaros recently graduated with a Master of Architecture from Columbia University (2010). With a B.A. in Psychology from Harvard University and a commitment to public health, she entered the field of architecture after coordinating a merger and renovation for the Children's AIDS Program (now SPARK Center) at the Boston Medical Center. She worked for several years as a project designer at Siris/Coombs Architects before entering graduate school.

Xiaomeng Xu is completing his Master of Architecture at Columbia University. During his undergraduate studies leading to a B.A. in Architecture at the University of Pennsylvania, Xiaomeng was awarded a full scholarship from the Hong Kong PCCW International Young Scholars Program. In 2008, he was selected to give a congratulatory address for the Beijing Olympic Games. With a strong passion for design, Xiaomeng has worked in architectural firms in both China and the United States.

Sang Ok Kim is a landscape designer and a graduate urban planner from Seoul, Korea. She holds a Bachelor of Landscape Architecture from Sydney and Master of Science in International Planning from The Bartlett, University College of London (2009). As a professional, she has been consulting in environmental management and landscape design in Shanghai, Hong Kong and Dubai.