TechCity**21**
Strategic Master Plan Until 2045   June 2015

TECHNION
Israel Institute
of Technology

TechCity**21**

Strategic Master Plan Until 2045

June 2015

- **Presidential Steering Committee**

President of the Technion, Prof. Peretz Lavie – Chairman of the Committee; *Senior Executive Vice President*, Prof. Moshe Sidi; *Executive Vice President and Director General of the Technion*, Mr. Matanyahu Englman; *Chairman of the Committee for Physical Development of the Board of Directors*, Adv. Rina Pridor; *Head of the Klutznik Center for Urban and Regional Studies*, Prof. Arch. Shamay Assif; *Head of the Planning Team*, Assoc. Prof. Architect Yael Moria; *Head of the Planning Team, Construction and Maintenance Division*, Arch. Vera Tsubari; *Mayor of Haifa*, Mr. Yona Yahav; *Mayor of Nesher*, Mr. Avi Binamo; *Director of the Haifa District for the Interior Ministry*, Mr. Yosef Mishlav; *Deputy Director General of Operations*, Ms. Zehava Laniado; *Head of the Construction and Maintenance Division*, Ing. Erez Eizner; *Chairman of Faculty Association*, Prof. Shmuel Zacks; *Chairman of the M4 Organization*, Dr. Avi Fishman/ Ms. Alla Rivkin; *Chairman of the Technion Student Association*, Mr. Danny Magner; *Chairman of the Architect Association;* Arch. Baruch Baruch

- **Professional Steering Committee**

Executive Vice President and Director General, Mr. Matanyahu Englman – Chairman; *Chairman of the Committee for Physical Development of the Board of Governers*, Adv. Rina Pridor; *Deputy Director General of Operations*, Ms. Zehava Laniado*; Haifa Regional Chief Planner*, Planner Liat Peled; *Haifa City Engineer*, Arch. Ariel Waterman; *Nesher City Engineer*, Ing. Leon Grodski; *Heads of the Planning Team*, Prof. Arch. Shamay Assif, Assoc. Prof. Arch. Yael Moria, Arch. Vera Tsubari; *Head of the Construction and Maintenance Division*, Ing. Erez Eizner

■ Planning Team

Heads of the Planning Team, Prof. Arch. Shamay Assif, Assoc. Prof. Arch. Yael Moria, Arch. Vera Tsubari; *Planning Manager,* Adv. and Planner Dorit Garfunkel; *Physical Planning,* Arch. Zvi Koren, Arch. Ziv Tamir, Arch. Ilya Muzaichuk; *Landscape Planning,* Moria Sekely Landscape and Architecture, Arch. Adi Levi-Trau, L. Arch. Amir Lotan, L. Arch. Marina Parhomovsky; *Preservation Advisors,* Arch. Ruth Liberty-Shalev, Arch. Amir Freundlich, Arch. Rakefet Sinai; *Environmental Planning,* Adv. Iris Han, Ms. Tal Goldrat (Head of Green Campus); *Ecological Advisor,* Assist. Prof. Daniel Orenstein; Dr. David Troupin; Ms. Ella Segal; *Green Architecture Advisor,* Assoc. Prof. Arch. Guedi Capeluto; *Agronomy and Forestry Advisor,* Agronomist Hanoch Burger; *Transportation Planning,* Assoc. Prof. Yoram Shiftan, Dr. Robert Ashak; *Transportation Engineer,* Mr. Yehuda Eshed; *Safety Advisor,* Mr. Pini Zalts; *Public participation,* Ms. Mor Shilon; *Programmatic Advisors,* Arch. Yonit Kaplan, Prof. Amnon Frankel, Ms. Tali-Noy Hindi, AVIV AMCG, Sakton Management and Entrepreneurship Ltd.; *Accessibility,* Arch. Yonit Kaplan; *Infrastructures,* Balasha-Jalon Infrastructure Systems Ltd.; *Electricity and Communications,* Mr. Itzik Romano; *BIM guidelines:* Assoc. prof. Rafael Sacks, Assis. Prof. Yasha (Jacob) Grobman; *POE guidelines:* Assist. Prof Efrat Eizenberg; *Academic involvement:* Arch. Zvi Koren, Assist. Prof. Efrat Eizenberg, Assist. Prof. Daniel Orenstein, Assist. Prof. Pnina Plaut *Geographic Information Systems,* Mr. Mordechai Shachaf / Mr. Gil Revivo; *Participation and Intervention,* Arch. Omri Zilka, Mr. David Aran; Ms. Karen Gal *Website,* Mr. David Aran; *Graphic Design:* Arch. Michal Gat-Morad, Arch. Einat Zinger-Morad; *Coordinator,* Ms. Keren Steger–Ben David

Executive Vice President and Director General

משנה לנשיא ומנכ"ל

From the The Director General

It is my pleasure to present the new 30-year strategic master plan for the development of the Technion campus – "TechCity21".

The TechCity21 strategic master plan, detailed in this document, was initiated by the Technion management and the Physical Development Committee of the BOG in its annual meeting in 2013 as follows:

"The Board of Governors supports the Technion management initiative to develop a new master plan for the campus".

The main mission of this initiative was to cope with the fast pace of change in the world of science, technology and education and the growing needs of the state of Israel.

To do so, TechCity21 articulated a series of goals, operational guidelines and a future image. All these, to make the campus a home for its students, faculty, staff and visitors, and to cooperate with, and compete successfully with many other world class universities around the globe.

I would like to thank the Faculty of Architecture and Town Planning and the Building and the Construction and Maintenance Division for ther joint efforts to develop the plan.

This academic–professional cooperation enabled the use of cutting-edge planning and design methods and technologies. It also incorporated broad participation of faculty, students, researchers and many users of the campus, in the process.

I would like to thank the president of the Technion, prof. Peretz Lavie who personally leads the presidential steering committee with the mayors of the cities of Haifa and Nesher and other campus stakeholders. I would also like to thank the heads of the planning team, prof. Arch. Shamay Assif, Assoc. Prof. Arch. Yael Moria, Arch. Vera Tsubari and the planning Manager, Adv. and Planner Dorit Garfunkel.

I am certain that the approval of the TechCity21 plan by the Board of Governors will help serve and promote the Technion vision.

Sincerely,

Matanyahu Englman
Executive Vice President and Director General

June 2015

Since its establishment more than 100 years ago in the Baerwald historical building in Hadar, the Technion has been developing at an unprecedented pace. Sixty years ago, it was the prime minister of Israel, David Ben Gurion, who chose the slopes of Mount Carmel facing the beautiful Haifa bay to be the site for the expanded Technion City. Prof. Alexander Klein laid out the first master plan, integrating the new campus into the city`s unique landscape. Since then, the wooded campus has become a hub of cutting-edge, world-class research and inspiring learning that has been constantly nourishing Israel`s growth, making it a "Startup nation."

Four more master plans led the accelerated development of the campus. We are honored to have been asked to develop the sixth master plan for the Technion City campus, which is herewith being presented to the Technion's BOG.

The coming 30 years will be even more demanding. The world of science and technology is changing, and the world of academia is becoming more and more competitive. To cope with these challenges, three parallel planning efforts were developed: a strategic plan; a new zoning code; and real-time interventions. These three plans propose a framework for doubling the campus` built space, adapting its infrastructure, and enhancing its indoor and outdoor spaces. It also calls for a much better integration into the urban fabric and surrounding natural environment.

Above all, the plan is promoting the combination of a "forest image" with a "city image" – green and wooded, while well-serviced, well-connected and vibrant. These two images are merging together to form a hybrid "forest city" image. The plan presented here is a major milestone in terms of its development, and will receive fine-tuning and detailed resolutions by the end of 2015. We are grateful for the exciting opportunity to work with Technion management, the BOG's Physical Planning Committee, representatives and citizens of the City of Haifa and Nesher, students, faculty members, professional consultants, as well as artists and colleagues from around the world. They have all contributed to developing the plan and will hopefully make "Technioncity21" a place of academic excellence and a home for its many users.

Sincerely,

Prof. Shamay Assif
Architect and Town Planner

Assoc. Prof. Yael Moria
Landscape Architect

Vera Tsubari
Architect and Town Planner

June 2015

Photography: Keren-or Grinberg

Introduction and Planning History

Introduction

Next to its human capital, the TechCity21 campus is the Technion's main asset.

The TechCity21 is a 130 hectare campus with 450,000 sqm. of built space – the size of an average neighborhood. The campus is a home to 24,000 students, faculty and staff members and every day hosts thousands of guests and users.

Following both the Physical Development Committee of 2012 and 2013's resolutions, the Technion Management initiated the TechnionCity21 planning process, aiming to prepare the campus for its 21st century challenges. The strategic plan presented here expresses the TechCity21 campus' planning and spatial management policy for the next three decades – until 2045

A joint venture of the Faculty of Architecture and Town Planning and the Construction and Maintenance Division formed a professional team headed by Prof. Arch. Shamay Assif, Arch. Vera Tsubari and Assoc. Prof. Yael Moria to lead the process. The process was closely monitored by a Presidential Steering Committee with the participation of the Mayors of Haifa and Nesher, government, users, and representative of all stakeholders, and was led by a professional steering committee headed by the Director General.

The plan is slated to serve the Technion management and its various divisions in an effective and advanced administration of all aspects of the TechCity21 campus.

■ Vision and Goals

The team and steering committees set forward the Planning vision to best support the Technion's vision:

The TechCity21 campus will offer effective and long lasting infrastructure, image, and spatial framework to best support the Technion's vision: "To be a science and technology research university, among the world's top ten, dedicated to the creation of knowledge and the development of human capital and leadership, for the advancement of the State of Israel and all humanity."

The team and steering committees set 10 goals for the TechnionCity21 process:

1. Nourish the Technion's human and social capital.
2. Foster innovation, advanced technology and excellence.
3. Facilitate international cooperation and competitiveness.
4. Strive for urban integration with adjacent cities and with Israel's Northern region.
5. Lead as an environmentally sustainable, safe and resilient campus.
6. Position the campus as a living laboratory of innovation, commitment and responsibility.
7. Be adaptive to change and uncertainty.
8. Offer a clear, legible and inviting spatial image.
9. Enhance its architectural and landscape heritage.
10. Build a vibrant and intellectual home that generates critical, inspiring discourse and encourages engagement among its various users.

■ The Plan as Stimulus for Academic Excellence

The Technion's daily and continuous challenges lie in its ability to attract outstanding students, leading researchers and qualified staff and to develop cutting edge knowledge, innovation and productive intellectual discourse. All of these are closely linked to the campus facilities and infrastructural development and to general campus life and atmosphere.

Therefore, the planning approach was to strive for spatial framework that will encourage academic excellence, creativity, innovation, and long-term, productive intellectual pursuits in all locations - both inside and outside classrooms and laboratories, in the dormitories, in coffee shops, in sports and leisure areas, along the avenues and on the pathways. The plan aspires to form an optimal spatial framework to cope with challenges academic institutions nowadays face and to:

• Make the Technion competitive in the academic world, locally and globally.
• Enable the integration and development of cutting edge technologies and approaches - both in education and in research.
• Encourage cross disciplinary discourse, learning and research and collaboration.
• Cater for new generations (the Y and Z generations who join academia)
• Adapt to changes in the economy of higher education, to new ways of enlisting resources, and collecting funds necessary for infrastructure, technology, and services.
• Emphasize the role of academia as a flagship of sustainable and environmental

responsibility.

■   The process

The planning process has been reflective, participatory and attentive to the direct needs and aspirations of students, faculty, staff, neighbors and visitors, highlighting the existing campus' strengths and weaknesses as perceived by its users.

The process was built as an ascending spiral repeatedly screening its components, gradually focusing and developing the planning products.

■   The Combination of Three Plans

The Tech City21 strategic master plan was launched as one of three parallel planning efforts looking at both short and long term needs and trends:

• **A strategic master plan** that equips Technion management with state-of-the-art tools and procedures that facilitate competition in the global arena of higher education and academic research and that position the campus as a frontrunner in excellence and inspiration. The plan is slated to enhance its unique spatial characteristics as a home base for its faculty, staff, students and visitors, and to lead the campus towards better integration in its urban and natural contexts.

• **A new zoning code** that revises the existing inflexible, obsolete, 1980 statutory framework. The new zoning is responsive to current and future needs and goals, and when formally approved by cities and regional planning committees, should facilitate the implementation of the strategic plan and overcome many of the rather anachronistic barriers of the existing 1980 zoning.

• **An active intervention and involvement plan** that takes immediate action to reflect and fulfill components of the strategic plan in real time. These interventions enhance the physical and social environment of the campus while serving as a platform for campus users and stakeholders to effectively take part in the planning process and implementation, and to articulate their needs and desires.

■   Public Participation and Academic Integration

The planning process has been reflective, participatory and attentive to the direct needs and aspiration of students, faculty, staff, neighbors and guests, highlighting the strengths and the weaknesses of the existing campus as perceived by its users.

The planning process has also been integrated into the teaching and research programs of the Faculty of Architecture and Town Planning and other academic units. Dedicated studio work, related seminars and research inputs were fed into the process and frequently challenged its outcomes. Local and International workshops with world experts on campus planning, sustainable campuses and campus transportation as well as on other issues were conducted. The process also included structured interviews, work with focus groups and 3 broad surveys (general inputs, transportation and housing) that reached a few thousand of the Technion students, researchers, administrative staff, and guests. Campus tours, artistic projects and Facebook pages were initiated to expose the future plans and create an informal platform for participation.

This participatory process creates special momentum, through real time intervention, study and research programs that induced close collaboration among management entities and between them and the academic work. This opened the door for further organizational and conceptual change.

■ Cutting Edge Technology

The process involved the close examination of recent trends in the global development of academic institutions and related campus design solutions. Many precedents, from well-established to experimental, were studied in order to position the TechCity21 campus within worldwide and local contexts.

The process also included the use of the best planning and design technologies and geographic information systems available. The full-scale, real time spatial interventions exercised new ways of perceiving, reflecting, curating and acting in space, and involved designers and design students, artists, campus users and the general public through multiple media networks.

■ Flexibility and Evaluation

Adopting the strategic plan and approving the new zoning is not the end of the process. The strategic plan sets an open, flexible framework encouraging its adaptation to changing needs and new challenges. The plan sets instructions for follow-up, evaluation and updates (through post occupancy evaluation (POE) procedures, Integration of Building Information Modeling (BIM) and so on).

The TechCity21 Planning History

In 1924, the Technion opened its first class with 16 students, constituting the first university in Israel, in Haifa's Hadar HaCarmel neighborhood. Due to its academic growth and the residents' objection to campus expansion in the Hadar HaCarmel neighborhood, a search for an alternate location began. Ultimately, with the encouragement of Prime Minister Ben Gurion, an area near Neve Sha'anan, at the time an isolated neighborhood, was allotted. In 1954, the Technion was gradually moved to its new primary location, between Neve Sha'anan and Nesher, on the northern slope of Mount Carmel.

The campus' first master plan was outlined by Architect Alexander Klein, at the time a well-known architect and head of the National Building Research Institute at the Technion. The fundamental concept of Klein's plan was the situation of separate academic units parallel to topography line, and their linkage with a peripheral road so that an inner ring would be designated for pedestrian traffic, and for the creation of a green, scenic pathway along the slope. The axis provides space for pedestrian paths between the faculties and a view to the Haifa bay.
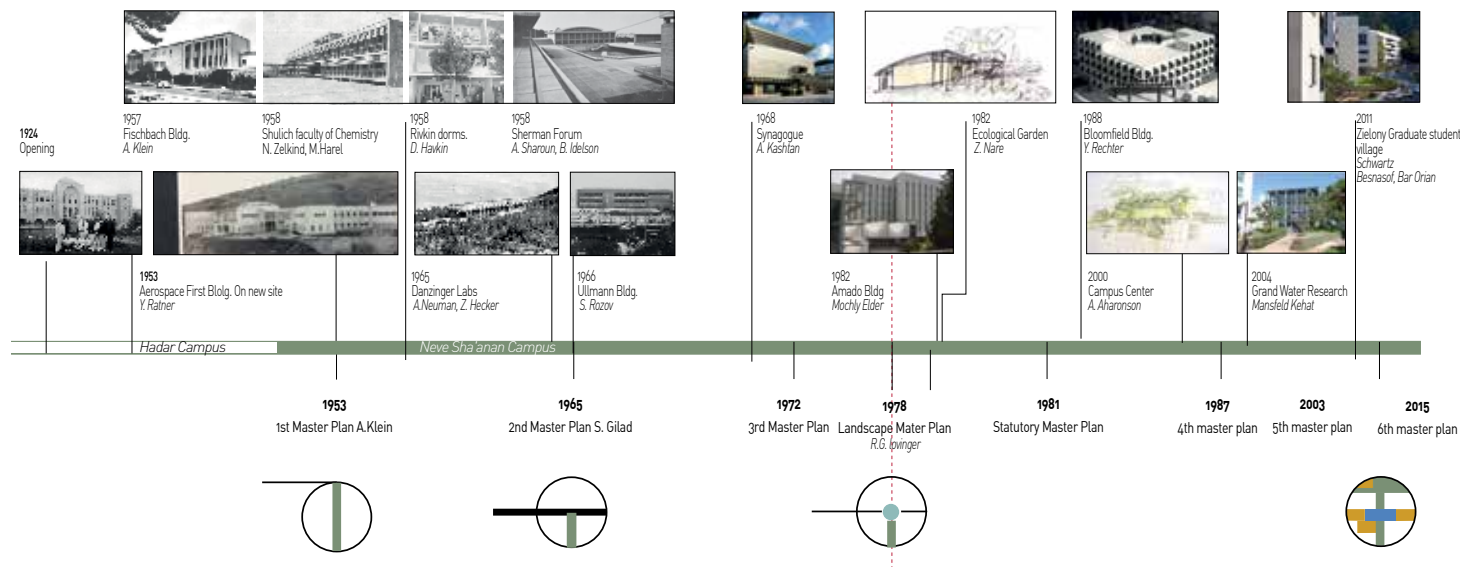
The general campus facilities were placed at the top end of the pathway, on a horizontal promenade. Student dormitories were situated near the sole entrance gate from Neve Sha'anan; junior faculty dormitories were positioned on the hill.

Klein's plan is still the Technion's most significant historical-architectural asset, and its effect is still noted throughout the campus. The main section of the campus was established according to this plan in 1952-1965, and most of the buildings built during this intensive building period hold historical and architectural significance on their own right.

Following Klein's plan, a new master plan was laid out by Architect S. Gilad who primarily organized existing, planned building and established an essentially urban horizontal axis to constitute the campus avenue.

Between 1965 and the early 1980's, the campus was developed mainly according to Gilad's plan, with the introduction of wider landscape and traffic plans, division of the campus into regions and the addition of dormitories.

Between 1986-1989, campus architect, Arch. A. Kirmayer along with Arch.Y.Yaar developed another master plan. This plan addressed development issues (including demolition and restoration). It also guided the development of the campus center, the promenade, the

1924 Opening

1957 Fischbach Bldg. *A. Klein*

1958 Shulich faculty of Chemistry N. Zelkind, M.Harel

1958 Rivkin dorms. *D. Havkin*

1958 Sherman Forum *A. Sharoun, B. Idelson*

1968 Synagogue *A. Kashtan*

1982 Ecological Garden *Z. Nare*

1988 Bloomfield Bldg. *Y. Rechter*

2011 Zielony Graduate student village *Schwartz Besnasof, Bar Orian*

1953 Aerospace First Blolg. On new site *Y. Ratner*

1965 Danzinger Labs *A.Neuman, Z. Hecker*

1966 Ullmann Bldg. *S. Rozov*

1982 Amado Bldg *Mochly Elder*

2000 Campus Center *A. Aharonson*

2004 Grand Water Research *Mansfeld Kehat*

Hadar Campus   Neve Sha'anan Campus

1953 1st Master Plan A.Klein

1965 2nd Master Plan S. Gilad

1972 3rd Master Plan

1978 Landscape Mater Plan *R.G. Ipvinger*

1981 Statutory Master Plan

1987 4th master plan

2003 5th master plan

2015 6th master plan

Buildings and campus development through the years

pedestrian walkways, the expansion of sports facilities and dormitories. It was proposed that the vehicular road crossing the campus be converted to a pedestrian promenade, leaving the traffic route on the ring road as in Klein`s plan.

The last master plan for the campus was prepared by arch. R.Lerman in 2003. The TechCity21 plan is going to be the sixth master plan.

In 1981, a zoning plan was approved by the municipal authorities and serves for issuing building approvals. This plan defines a building capacity of almost 500,000 sqm. The plan divides the campus according to building uses: Academic buildings, dormitories, public facilities and sports - at that time 250,000 sqm. were already built. The plan determined the exact location and size of new buildings. This limitation made the campus development difficult.

The new zoning plan, promoted along with the "TechCity21" master plan, will replace the 1981 zoning plan. It enables flexible location planning for the future buildings and adds to the building capacity (up to 950,000 sqm.).

TechCity**21**

Chapter 1: **The Vision, Goals and Program**

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The Vision

The planning of the TechCity21 campus began with determining a clear, agreed upon vision:

The TechCity21 campus will offer effective and long lasting infrastructure, image, and spatial framework to best support the Technion's vision: "To be a science and technology research university, among the world's top ten, dedicated to the creation of knowledge and the development of human capital and leadership, for the advancement of the State of Israel and all humanity."

....
The Goals

1. Human capital – To improve the space with the leading priority of developing the human and social capital of campus users in all their diversity and communities.

2. Innovation & excellence– To establish a spatial framework encouraging innovation and excellence in groundbreaking research and effective, inspirational teaching. To allow the implementation of new and developing technologies in teaching, research, and spatial management.

3. International Cooperation & competitiveness – To develop an open, inviting, pleasant, and competitive space – a leading link in the global academic chain.

4. Sustainability, safety & health – To establish TechCity21 as a leading campus in regard to environmental, safety and health issues, governed according to comprehensive, sustainable planning and management principles – a model in saving perishable resources, working towards zero carbon emissions while minimizing negative environmental influences on the natural urban environment. Protecting biological diversity and ecological system services it provides, and demonstrating constant concern for safety, health and strength.

5. Connectivity, accessibility, and legibility – To increase campus accessibility, create a variety of mobility and transportation options and to emphasiz pedestrians, cycles and public transportation. To improve campus orientation for all people.

6. Urban Integration– To be well integrated in the surrounding urban and scenic space and in the metropolis of Haifa and of northern Israel. To create a bridge between cities and communities,

Human capital

Innovation & excellence

International Cooperation & competitiveness

Sustainability, safety & health

Connectivity, accessibility and legibility

Urban Integration

Plan for uncertainty

The spatial image and heritage

Living laboratory

Intellectual home

between academia and industry, and between HaCarmel National Park and the bay.

7. Plan for uncertainty – To provide a spatial, effective, full and available response to rapidly changing needs and to organizational changes that may be difficult to predict today.

8. The spatial image and heritage – To create an image of a clear, legible, inviting, responsive, and inventive place emphasizing on the exclusive values of landscape and architecture – a special place to remember and to miss.

9. Living laboratory – To position the campus as a living and active laboratory of spatial innovation and social and environmental commitment to the State and to all of humankind.

10. Intellectual home – To nurture and develop an abundance of living, learning, research, and activity spaces for students, researchers employees and visitors, to expand the development of communities, and to connect between communities.

....

The program: The development of the built space

■ Built space addition

The TechCity21 campus currently houses over 200 buildings of roughly 444,000 sqm. These buildings were built in a continuous process that lasted more than 60 years.

The continuous development reflects the increasing demand for built space for academic needs, dormitories, welfare and innovation. This process is expected to continue in the upcoming years at a similar pace.
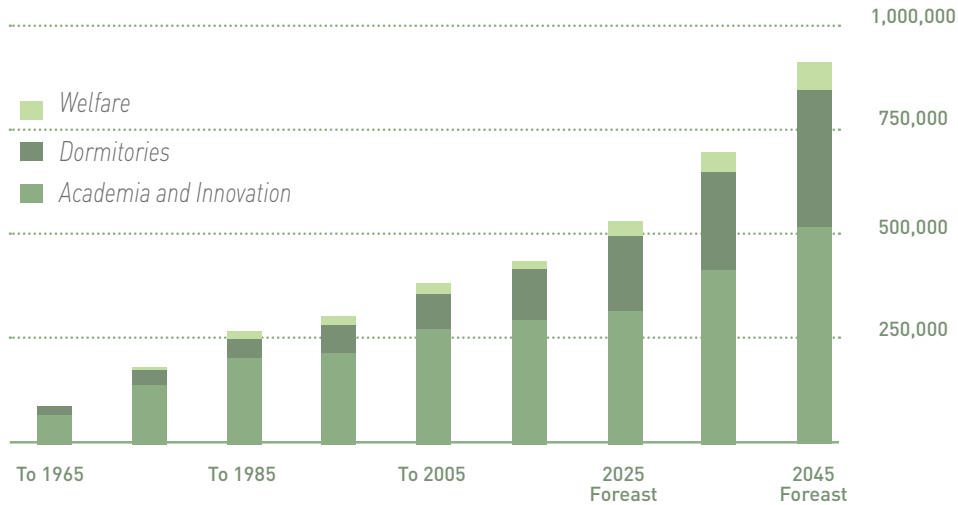
TechCity21 built space development by decade.
Academic areas include teaching and research laboratories, classrooms, halls, offices, and associated technological services.

The projected additional population was estimated to be limited in accordance with a policy of not increasing the number of students pursuing bachelors' degrees, and to steadily increase the number of students pursuing advanced degrees. The addition of land for building was defined by several considerations: a) The estimated increasing population of Technion users based upon additional faculty, students pursuing advanced degrees, and campus residents; b) Increasing the land required per student/researcher/employee/resident in relation to currently existing land; c) Desired development of applications in accordance with plan objectives such as significantly expanding the dormitories, and providing housing solutions for students pursuing advanced degrees and their families; additional welfare services derived from the additional campus users, and changes in the sequence of use, innovation centers, and a notable addition of laboratories.

There is no direct link between the (limited) increase in the number of campus users and the increase (almost double) of space slated for building (While projecting as increase in built space, this program emphasizes on renovation, retro-fitting and re-using the existing built space).

32,430

27,235

Staff
Students

Staff
Students

Existing situation   Projection
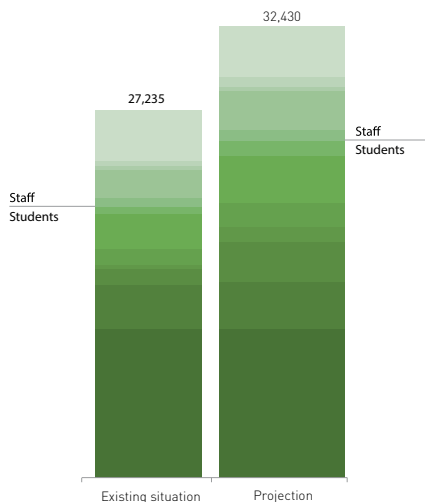
Projected campus population growth

- Administrative and technical staff (Technion, TRDF, practical engineering school)
- Center for pre-university education & Practical engineering school teachers
- Emeritus
- Other staff members (TAs, and others)
- **Senior academic staff**
- Continuing education
- Center for pre-university education
- Practical engineering school
- Post-doc and international
- Doctoral students
- Master students
- Undergraduate students

Population Group	Existing situation	Projection
Undergraduate students	9,492	9,500
Master students	2,817	3,000
Doctoral students	1,015	2,500
Post-doc and international	240	1,000
Practical engineering school	1,000	1,500
Center for pre-university education	2,226	3,000
Continuing education	500	1,000
Total no. of students	17,290	21,500
Senior academic staff	552	650
Other staff members (TAs, and others)	1,800	2,500
Emeritus	231	250
Center for pre-university education & Practical engineering school teachers	307	615
Administrative and technical staff (Technion, TRDF, practical engineering school)	3,215	3,215
Total no. of staff	6,105	7,230
Total no. of others	3,840	4,700
Total population	27,235	32,430

Projected campus population growth

TechCity**21**

Use	Existing (sqm.)	Future (sqm.)	Addition (sqm.)
Academia	253,000	423,000	170,000
Dormitories	122,000	310,000	188,000
Welfare	24,000	65,000	41,000
Innovation	45,000	90,000	45,000
Total	444,000	888,000	444,000

*Added built space by uses (including service areas)*

Existing built space including service areas (ca. 30% of total space, depending on use).

■ Built Space Reserve

The new zoning plan - the legally binding framework of building rights - adds an extra 62,000 sqm. of built space to allow flexibility.

	Existing (sqm.)	Future (sqm.)	Addition (sqm.)
Built space	444,000	888,000	444,000
Reserve	0	62,000	62,000
Total	444,000	950,000	506,000

Added built space + reserve

Total additional built space including reserve
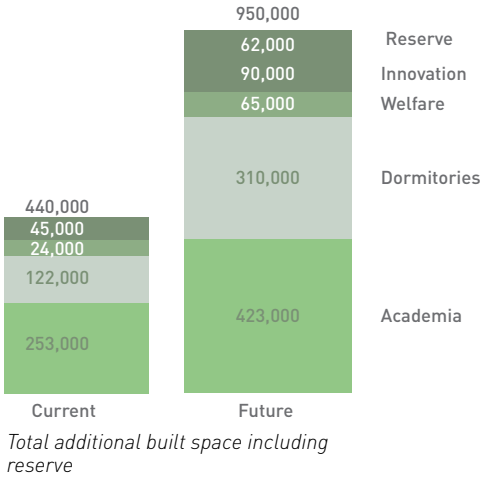
Chapter 2: **The Campus Image**

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The Forest Image

The main component of the planning process and its three products is to identify, and ultimately to create the future image of the campus. This image should reflect and even improve the campus's quality and performance, and directly support its multiple goals. It should best express the vision stated. This image is meant to address and support the large addition of built space and the relatively heavy infrastructure. It is supposed to serve as an inspiration for intensive learning, interdisciplinary discourse, cutting edge research, and effective innovation. It should make the campus a home for all users.

The image developed is an innovative combination of two distinct components, almost apparent opposites. The first component is the image of the green, soothing, embracing, informal and reflective forest. The TechCity21 campus can be perceived as an integral component of the abundant Carmel Forest sloping from the Carmel ridge to the campus. The forest is green, shadowed, an oasis of tranquility and a refuge. The natural forest (although originally a planted forest) is characterized by growth, renewal, and constant change. It affords movement in various directions, and the ability to stroll, to walk along existing paths and to discover new paths. It provides the opportunity to pause and rest, to meet passersby, and to be aware of the forest's ever changing landscape.

The campus as a forest is distinct in its scenic and botanical diversity. Aside from its southern section, referred to in this plan as the "Technion's Woods", the entire campus contains groups of trees in large, compelling clusters. Most of the campus is situated in a forest of conifers, and the most prominent among them is the stone pine. The Technion woods also have other species such as brush and oak trees, and in built-up areas there are many other beneficial and aesthetic trees.

About 60% of the campus, roughly 74.5 hectares, is forested and foliated. This ratio provides the campus with its unique forest feeling and functions as a quality green lung, both for itself and for the adjacent urban fabric.

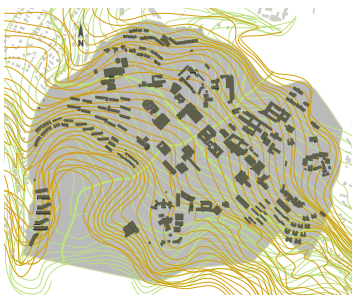There are several benefits to developing the campus as a forest:

1945

1964

1975

1991

2015
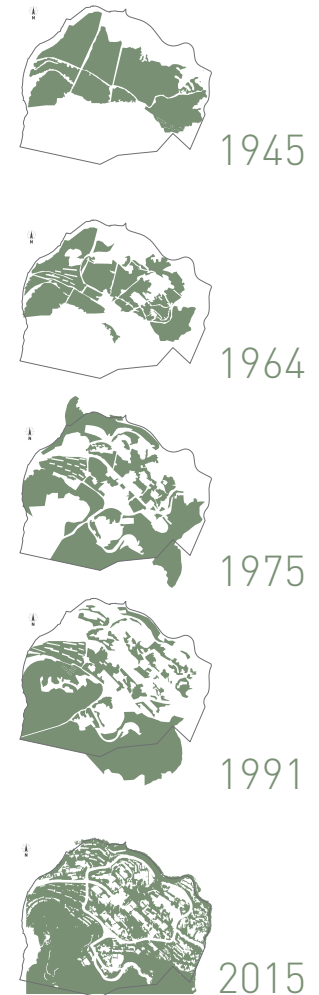
Forest development through the years
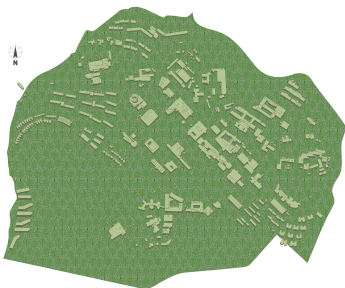
The forest image

The city image

The "ForestCity" network
see detailed map, page 117

The academic benefit – A relaxing, tranquil environment for research, study, and for easy relief. A source of inspiration for learning and research, an outdoor leisure experience for healthy, physical activity, and a means for reinforcing a sense of belonging and as a living laboratory for research and teaching.

The environmental benefit – Reducing the urban heat island, decreasing noise, minimizing pollution, and contributing to a sense of physical-climatic comfort in an open space, providing a habitat for biological diversity and continued regular supply of 'ecosystem services', sequestering carbon and providing a hydrological sink encouraging ground-water recharge and reducing surface runoff.

An exclusive identification, an open scenic space that contributes to the cities and to their bordering neighborhoods – a unique, aesthetic experience.

....

The City Image

The second component is the image of the city, which is rich, dynamic and vibrant. The city is a space that encompasses a variety of people, rich activity, productivity, and possibility. It encourages reciprocal enrichment, experimentation, wonderment and innovation, and constitutes a basis for creativity and entrepreneurship.

TechCity21 is already characterized by its bustling, diverse activity parallel to that of a city – streets, promenades, and well-maintained parks with an urban flair. All of these will need to evolve with the substantial addition of living quarters for diverse populations, with the adaptation of diverse study spaces, with the creation of additional study spaces, and with the addition/redirection laboratories, systems and services, welfare, culture and sport.

The leading principle of the ForestCity is "mixed–use" allowing continuous activity throughout the day, week and year throughout the campus.

The considerable additional activity will contribute to improving walking and accessibility as well as orientation on campus.

Another principle is the connection between the campus and its environment. The campus is directly adjacent to, and in essence embraced by the eastern suburbs of Haifa and the city of Nesher. The campus' urbanism will improve its connection to the cities, and will nurture the reciprocal advantage of the campus and of its neighboring cities.

There are benefits to developing the campus as a city as well:

The academic benefit – Reinforcing the interaction and collaboration between scientists, students and teachers, and the academic community with the public; making the Technion more attractive for students, researchers, and visitors as a living, intriguing, dynamic space, and bolstering its international character.

The environmental benefit – Focused, intensive building and effectively utilizing the built-up land facilitates energetic productivity and the preservation of open spaces. It encourages walking, accessibility, and minimizes the use of motor transportation.

The "ForestCity" Image

Preliminary analysis demonstrates that both images, the image of the forest and the image of the city, are at odds with one another. Closer inspection, however, indicates that this conflict also provides a great opportunity, and is the primary planning/design challenge of all three TechCity21 plans – this strategic plan, the zoning plan, and the intervention plan.

The plans offer an innovative way to combine these two seemingly contradictory images into one hybrid image – that of the ForestCity. Perhaps it is no coincidence that the Hebrew words that comprise the words for 'city' (עיר) and 'forest' (יער) consist of the same three letters, and was almost constructed from one another or alongside one another to spark inspiration and to form a new image.

The planning team studied the campus' topography, the existing networks that represent the city image and the hidden networks that represent the forest image. All of these create the interlacing ForestCity network Image.

This image has the potential to significantly improve accessibility in and to the campus. With this purpose in mind, a computerized, parametric model was developed to direct and inspire the detailed planning and design.

The ForestCity Network

To develop the the ForestCity image, the "TechCity21" plan determines different levels of landscape preservation. The plan preserves most of the Technion's woods, formerly designated for development and creates a north to south ecological corridor that connects the Technion woods through a series of well-preserved parks, the Sherman Forum, the Main Lawn and the Gutwirth Ecological Garden stretching down towards the big Nesher quarry and the bay area.

The ForestCity image is also enhanced by preserving the rich array of existing trees and by directing most developments to build or paved areas primarily in four development districts. These four development districts will absorb up to 70% of the new development to form vibrant urban environments. New trees, gardens and pedestrian landscaped areas will also be added along urban streets, avenues, lawns and inner yards. Green roofs will further integrate the urban environments with the forest and provide gradients of ecological productivity from the open to the built space.

The leading principle linking the Forest and the City is the Network principle. Rich, diverse networks create a sense of flow, equality, flexibility, and autonomy for the various entities that comprise it. A network is characterized by an internal system of laws, but can also connect to the entities outside it, and can expand and grow.

The Technion already conducts a multitude of networks, some physical such as transportation, and some service networks such as coffee shops and dormitories. Other networks are not physical, such as networks of knowledge, information and development, virtual networks, media networks, and collaboration networks, both on the local and global scale.

■   The ForestCity Network as a planning tool

The planning process included an attempt to develop a new planning tool to integrate the forest and the city images to the hybrid ForestCity. The ForestCity network proposes a flexible, three-dimensional organization of the building layout and of pedestrian access throughout the entire campus in both its built and open space areas.
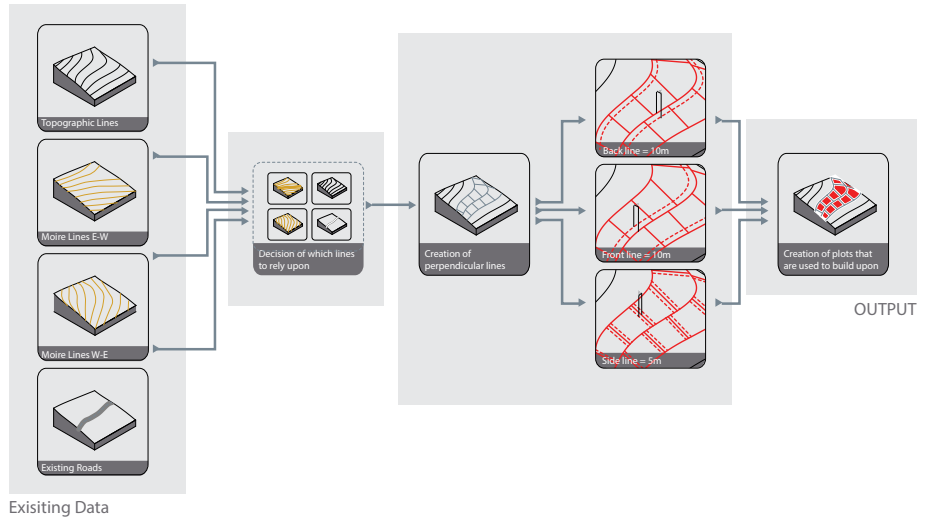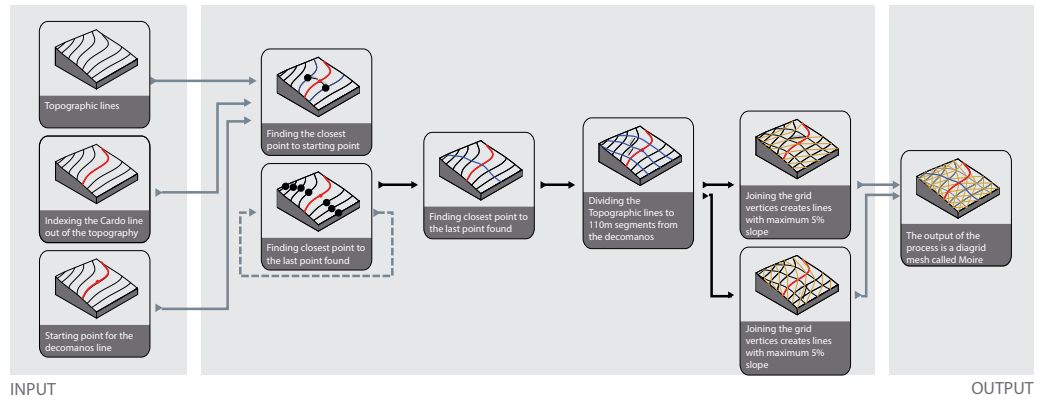
The ForestCity network was laid out with the use of parametric, digitized planning tools that enable its adjustment to changing topographic, landscape and functional conditions. It attempts to overcome topographic challenges and to offer better access to new buildings, construction, retrofit and landscaping attempts.

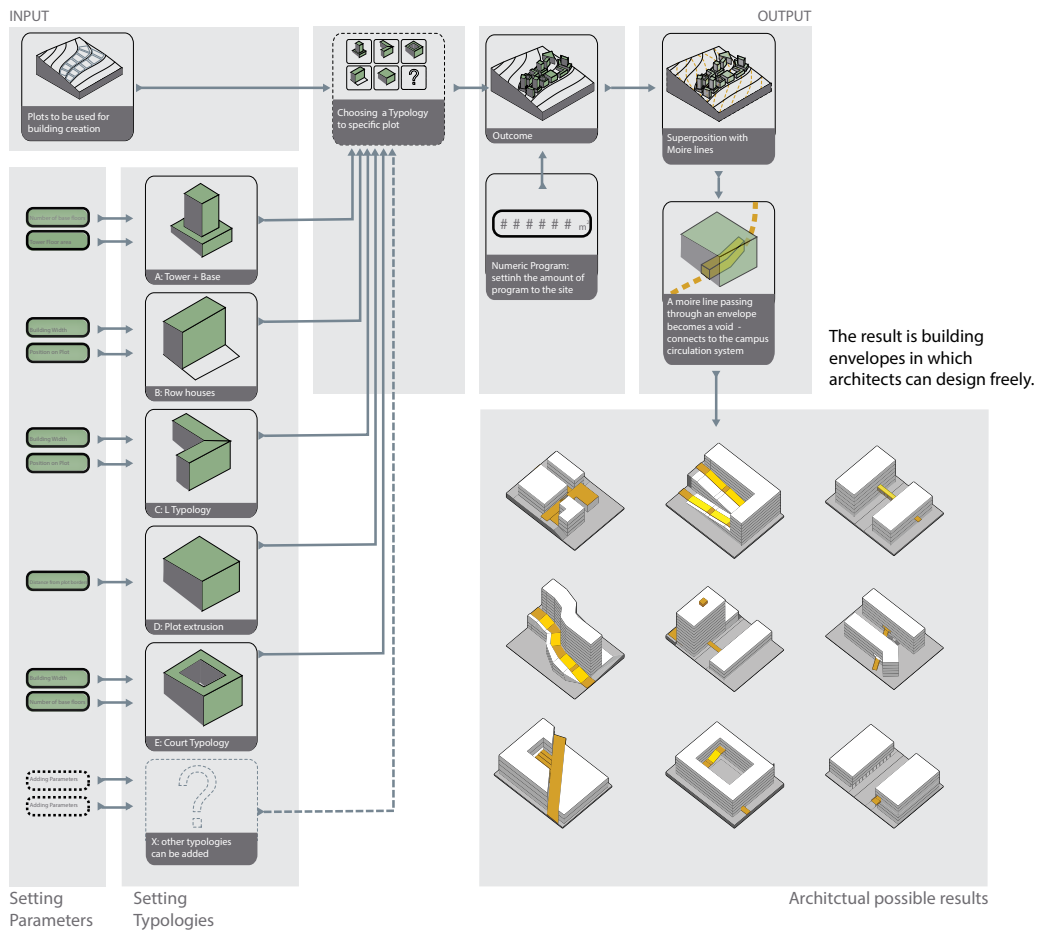The ForestCity network offers three types of lines that when integrated can direct spatial development on campus:

a. Lines of equal height (following topography, with a slope close to zero), including most of the existing paths on campus, allowing the creation of longitudinal avenues that cross the campus. These avenues incorporate foot traffic, motor traffic, and pedestrian and bicycle traffic;

b. Topography perpendicular lines that can be used mainly as stairways, and as bridges leading into buildings using elevators and inner staircases as public vertical connections.

c. Diagonal lines with a slope lower than 4.5%. These lines represent convenient walkable and bikable lines. They hold the potential of free movement in the sloped terrain of the campus both outdoors and indoors, thus becoming a system of shortcuts and strolling paths that encourages exploration and discovery.

Parametric model of the ForestCity network

Topographic lines

Indexing the Cardo line out of the topography

Starting point for the decomanos line

Finding the closest point to starting point

Finding closest point to the last point found

Finding closest point to the last point found

Finding closest point to the last point found

Dividing the Topographic lines to 110m segments from the decomanos

Joining the grid vertices creates lines with maximum 5% slope

Joining the grid vertices creates lines with maximum 5% slope

The output of the process is a diagrid mesh called Moire

INPUT

OUTPUT

Topographic Lines

Moire Lines E-W

Moire Lines W-E

Existing Roads

Decision of which lines to rely upon

Creation of perpendicular lines

Back line = 10m

Front line = 10m

Side line = 5m

Creation of plots that are used to build upon

OUTPUT

Exisiting Data

30 TechCity**21**

INPUT

Plots to be used for building creation

Choosing a Typology to specific plot

Outcome

Numeric Program: settinh the amount of program to the site

OUTPUT

Superposition with Moire lines

A moire line passing through an envelope becomes a void - connects to the campus circulation system

Number of base floor
Base floor steps

A: Tower + Base

Building Width
Stories on Plot

B: Row houses

Building Width
Stories on Plot

C: L Typology

Space from plot border

D: Plot extrusion

Building Width
Number of base floor

E: Court Typology

Adding Parameters
Adding Parameters

X: other typologies can be added

Setting Parameters

Setting Typologies

The result is building envelopes in which architects can design freely.

Architctual possible results

Chapter 3: **The Spatial Structure**

This chapter outlines the spatial structure of the future campus. It refers to preservation policy, built and landscape development. It is based on the hybrid, collaborative ForestCity Network that forms a 'new topography' and a renewed accessibility grid.

....

The Districts

The plan divides the campus into three types of districts with different programmatic and spatial functions. This distribution outlines the scope and character of the new developments, retrofit and landscaping. It also refers to the existing landscape preservation and built space.

....

The Development Districts

The plan identifies four development districts for the absorption of 70% of future development and major renewal: Northern, Southern, Eastern and Western districts. These four development districts comprise roughly 35 hectares (28% of the inclusive area of the campus).

The development districts are situated in strategic locations directly adjacent to the center of the campus and to the entrance gates from the direction of Nesher and Haifa, in old areas that need renewal. The significant construction in the four districts is an opportunity to implement a mixed use of academia, innovation, welfare and housing. Concentrating development into these four districts fosters interaction between users and allows the creation of a vibrant urbanity in key areas of the campus.

....
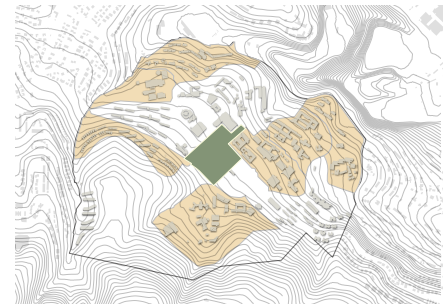
The Ecological-Historical Corridor

The continuum of areas connecting the southern end of the campus to its northern end forms the "Ecological-Historical Corridor" of the campus.

This corridor spans along 35 hectares that constitute a corridor that suits the development principles set forth by Architect Klein.
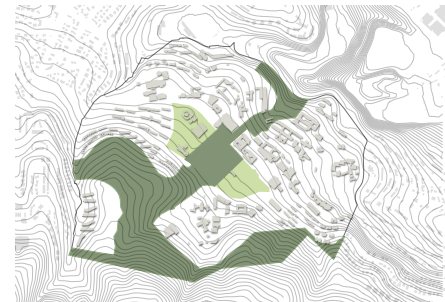
While the existing statutory zoning plan designated the southern area of TechCity21 for

Development Disctricts

Moderate Development

Ecological Historic Corridor

The planing Districts

construction, this plan defines this area as the **Upper Technion Woods** - a limited development area, as these woods are a prominent component of the campus' image and character. The Ecological-Historical corridor slopes north, towards the Gutwirth Ecological Garden.

The Moderate Development Districts

Roughly 570 hectares of the distributed areas slated for moderate development of up to 30% of the building addition detailed in this plan. In these areas, there will be a balanced combination of demolition and new construction, building additions according to needs and opportunities. These changes will preserve architectural and landscape values, and nurture the open space between the buildings.

Distribution by District and Use

The plan advocates for a mixed use development throughout the campus, trying to soften the distinction between academic, residential and other uses.

Existing built space (sqm.) by site and Use (2015)

	Academia	Dormitories	Welfare	Innovation	Total
Eastern District	8,800	26,100	0		39,900
Western District	0	14,600	0		14,600
Northern District	46,100	0	0		51,600
Southern District	2,700	23,500	1,500		27,700
Total in Development Districts	57,600	64,200	1,500	10,500	133,800
Campus Center	23,100	0	12,300	5,000	40,400
Upper Hill	43,200	0	0	6,500	49,700
Promenade-east	72,500	0	0	11,500	84,000
Affiliates	11,200	0	0	6,000	17,200
Life Sciences	45,700	0	0	5,500	51,200
Undergraduate Dormitories	0	29,900	300	0	30,200
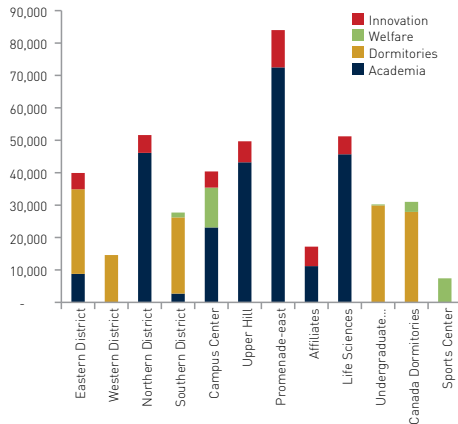
	Academia	Dormitories	Welfare	Innovation	Total
Canada Dormitories	0	27,900	3,100	0	31,000
Sports Center	0	0	7,400	0	7,400
Total Built Space	253,300	122,000	24,600	45,000	444,900

Additional built Space (sqm.) until 2045

	Academia	Dormitories	Walfare	Innovation	Total
Eastern District	60,000	40,000	10,000	15,000	125,000
Western District	6,100	34,000	7,000	3,000	50,100
Northern District	60,000	40,000	7,000	3,000	110,000
Southern District	0	25,000	0	0	25,000
Total in Development Districts	126,100	139,000	24,000	21,000	310,100
Campus Center	7,500	8,000	5,000	1,000	21,500
Upper Hill	7,500	8,000	0	1,000	16,500
Promenade-east	7,500	3,000	2,000	2,000	14,500
Affiliates	5,000	10,000	1,000	19,000	35,000
Life Sciences	14,600	0	0		15,600
Undergraduate Dormitories	1500			0	6500
Canada Dormitories	0	15000	4,200		19,200
Sports Center	0	0	4200		4,200
Total Built Space	169,700	188,000	40,400		443,100
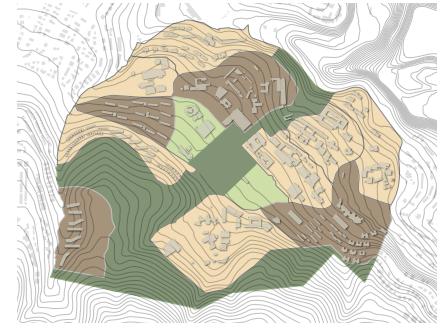
The planing districts
See detailed map, page 114

Legend:
- Innovation
- Welfare
- Dormitories
- Academia
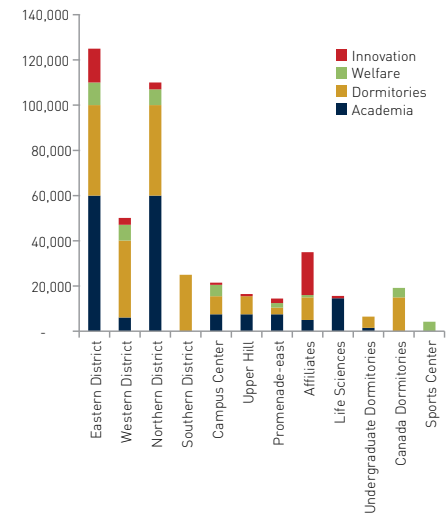
Total built Space (existing + addition) in sqm. until 2045 (including reserve)

	Academia	Dormitories	Welfare	Innovation	Reserve	Total
Eastern District	68,800	66,100	10,000	20,000	12,500	177,400
Western District	6,100	48,600	7,000	3,000	–	64,700
Northern District	106,100	40,000	7,000	8,500	10,000	171,600
Southern District	2,700	48,500	1,500	–	1,000	53,700
Total in Development Districts	183,700	203,200	25,500	31,500	23,500	467,400
Campus Center	30,600	8,000	17,300	6,000	5,000	66,900
Upper Hill	50,700	8,000	–	7,500	18,500	84,700
Promenade-east	80,000	3,000	2,000	13,500	1,000	99,500
Affiliates	16,200	10,000	1,000	25,000	10,000	62,200
Life Sciences	60,300	–	–	6,500	1,000	67,800
Undergraduate Dormitories	1,500	34,900	300	–	1,000	37,700
Canada Dormitories	–	42,900	7,300	–	1,000	51,200
Sports Center	–	–	11,600	–	1,000	12,600
Total Built Space	423,000	310,000	65,000	90,000	62,000	950,000

RESERVE
Innovation
Welfare
Dormitories
Academia
LImited Development

Mixed use by district

■ Recommendations

a. Design and planning teams will be established to prepare comprehensive plans for the four development districts and four preservation areas.

b. The amount of built space will be distributed between districts and uses as detailed above.

c. A variety of mixed use solutions will be examined. Plans preparations will also include the establishment of a specific program and detailed design guidelines of preservation and development for each district in accordance with this plan's recommendations, the district's unique local characteristics and its relation and connection to other districts.

d. The planning teams will be led and coordinated by the Construction and Maintenance Division
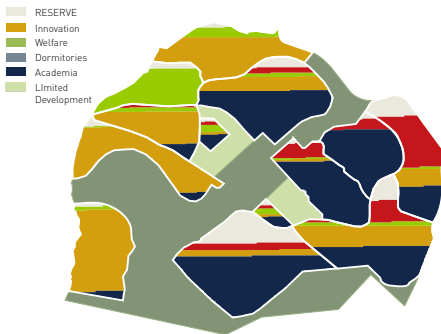
Landscape Preservation

The campus' unique spirit is undoubtedly its location within the forest - cluster of varying buildings, scattered in a forest. Over the years, the forest matured, the treetops expanded, and the open space got the benefits of a campus located in the heart of nature.

Following the ForestCity image, and in correspondence to the diverse and rich forest vegetation across the campus and its surroundings, the tree canopy cover will be a key principle in designing the entire campus landscape.

- Recommendations
a. Campus planning will be conducted with the objective of creating a broad and dense tree canopy cover in order to maintain the forest ambiance.
b. Existing tree canopies on campus will be optimally preserved according to the landscape standard chart.
c. Planting new trees and thinning out existing trees will maintain a natural 'free' dispersion of tree canopies to the greatest possible extent, and will prevent the formation of orthogonal rows.
d. Uprooting existing trees will require planting trees in their place.
e. Preparing comprehensive plans for the areas will consider scenic preservation ranking as detailed.

- Landscape Preservation Ranking

In correspondence to the different levels of development of the built environment, the campus area has been divided into levels of scenic preservation, following existing scenic and forest space qualities. The scenic ranking reflects three parameters – preservation of existing tree inventory, the ratio between built and open spaces (only at ground level), and actions taken to densify the forest. These principles will be implemented in all future plans according to the degree of scenic preservation in the proposed levels.

Strict Landscape Preservation (dark green)

The Technion Woods and the Gutwirth Ecological Garden were defined as a 'hands off' section (excluding forest management and maintenance; the future cable car station and development of forest activities such as forest related education, recreation, research, and environmental
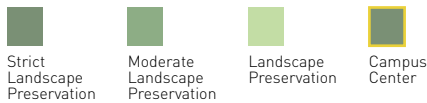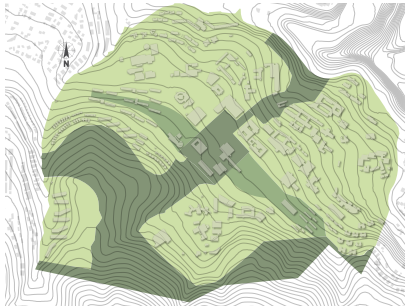
Landsacape preservation ranking
See detailed map on page 115

Strict Landscape Preservation   Moderate Landscape Preservation   Landscape Preservation   Campus Center
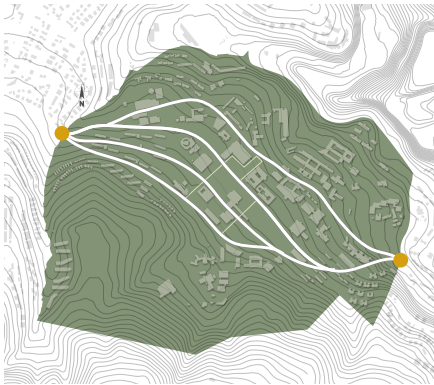
The Branching Avenues

monitoring): increasing accessibility for campus community and visitors, thinning vegetation for forest health, creating and maintaining fire barriers, and removing/ trimming dangerous and/or sick trees. Steps will be taken in these areas to replant trees as needed and according to forest aging.

Moderate Landscape Preservation (medium green)

The Rifkin dormitories area, Lokey and Kislak Parks, the future cable car station, and the expansion of Zielony graduate village are ranked as important in terms of existing forest value, or in terms of proximity to the Technion woods and visibility from a distance. In these areas, at least 60-80% of the existing inventory of trees will be maintained. To the greatest extent possible, trees will be replanted or replaced. The open to build ratio in these areas will be kept as high as possible so that most of these areas will stay open.

Together, these areas connect Susan and David Wilstein Neve Sha'anan Gate and Clara Franziska Mertens Nesher Gate, and create a horizontal sequence of a unique and significant grove in terms of climate and vegetation, with recreational and spatial qualities.

The plan recommends the preservation and intensification of this sequence as well as extending it to adjacent cities.

Landscape Preservation (light green)

At the remaining campus areas, at least 40-60% of the existing inventory of trees will be preserved. New construction sites will be reinforced with high density of tree canopy cover to ensure the quality of open spaces.

The Branching Avenues

Four branching avenues spanning from east to west serve as the primary orientation avenues. Each follows a flat route and serves mainly pedestrian and bicycle traffic. The avenues are designed to strengthen convenient connectivity within the campus, and to form a continuous pedestrian-friendly link between Haifa and Nesher and the existing gates, the campus center,

and the future cable car stations.

The four avenues are: the Central S. Zielony Promenade, the ForestCity Avenue, the Upper Avenue part of the David Rose Avenue, and the Lower Avenue that crosses the Gutwirth Ecological Garden and connects Maurice Amado Mathematic Bld. and Siegfried and Irma Ullman Teaching Center.

Along those four primary avenues a system of vertical pathways is proposed to increase the connectivity from north to south and to new planned gates. It includes a system of staircases, elevators and bridges. A sub-system of pathways will ensure easier access to most existing and planned buildings, and will be provided with an 'urban address' to improve orientation. In addition, the plan proposes a diagonal system of highly accessible pathways, through or between public structures.

- Recommendations

a. Along the branching avenues there will be a pedestrian- bicycle priority and necessary adaptations will be conducted for this purpose, including the establishment of a public program, elimination of parking spaces, addition of lighting and street furniture, and the provision of parking racks and bathrooms for bicycle riders. In order to create a visually "clean" and organized space and maintain the forest-like character of the space, the amount of street furniture and three-dimensional elements along the avenues will be in moderation, avoiding overabundance of elements.

b. The branching avenues will be designed as public spaces that encourage people to sit and linger. The design will focus on improving the entrances to faculties, the addition of street furniture, and the incorporation of dining and coffee options.

c. Development will be made within the utmost care in preservation of existing trees and with the initiative of planting additional trees.

d. A comprehensive plan will examine the possibility of thickening the structures along the branching avenues, primarily along the central promenade - in order to enable and encourage mixed uses such as dormitories, employment, and commerce.

e. Each of the branching avenues will be designed according to a specific spatial and programmatic section as detailed:

- David Rose Avenue – a scenic forest path
- ForestCity Avenue – which crosses four groves at the heart of the campus
- The Central Avenue – will be enhanced as an urban promenade and will offer public activities of the campus as a whole

f. The Ecological Garden Avenue (the lowest avenue) will create a series of spaces identified by the large faculties besides them.

g. Prioritizing pedestrian traffic in the branching avenues will be carried out through:
- Raising the road level to the level of the sidewalk
- Narrowing the width of the road lanes and the parking spaces along them (according to the suggested sections)
- Reducing or eliminating parking spaces (in avenues that currently include parking)

h. Prioritizing bicycle traffic in the branching avenues will be carried out, among other methods, through the addition of parking, tire pumping facilities, water fountains etc.

i. Where parking spaces will be eliminated, trees will be added by a ratio of at least one tree to every four parking spaces. The species of the trees will be determined according to each particular avenue.

j. As part of the plan of the branching avenues a lighting master plan will be included with the objective of creating unique lighting elements to visually distinguish and link the avenues.

....

The Promenade

The promenade is the main component of the campus' spatial layout. Most of the promenade currently exists and already functions as the central space of the campus. It connects the campus' most important structures and spaces.

The plan of the Promenade will create a clear link between both edges - Neve Sha'anan and Nesher.

■   Recommendations

Segment A – Starting from the Susan and David Wilstein Neve Sha'anan Gate. Changing the current section with an emphasis on creating a scenic path in the forest. Among other factors, the following means will be examined: expanding the sidewalks for pedestrian and bicycle traffic, adding trees, and building a panel of welfare services on the ground floor at the south side.

Segment B – Eliminating the road segment between Roth Family Plaza and the existing entrance to Zieloney central promenade, creating an alternative underground parking lot, extending the promenade to create a continuous space, re-adapting the space for pedestrians.

Segment C – The central pedestrian Zielony promenade, which connects the existing public buildings, the Main Lawn and Kislak Park.

Segment D – Development of a future segment from Ring Road to the future cable car station D, adjacent to the Danziger Mechanical Engineering Building.

Segment E – Development of a future segment to the Clara Franziska Mertens Nesher Gate.

The Campus Center and Main Lawn

The Campus Center, composed of the Main Lawn - the green heart of the campus, the student center and the forum complex is a main concourse of the campus. It is the students' service center, a leisure space, a meeting point, a performance locale and ceremonial arena. It symbolizes the heart of the social life and extracurricular activities of the campus.

The Campus Center lies at the intersection of the branching avenues and the unique natural preservation area (the green passageway). The Campus Center is a very important site due to its natural and architectural assets. Therefore, its planning requires a distinct policy which will enhance the experience of ForestCity.

■ The campus center includes:

- **The Main Lawn** – aims to serve as a meeting point for students and scholars from different disciplines, a space for relaxation and recreation, socializing and exchanging ideas. The Main Lawn also serves as the primary location for official ceremonies and events that attract students and outside visitors alike.

- **The Sherman Forum complex** - a milestone in Israeli architectural heritage. Designed by Architect Arie Sharon, one of Israel's most prominent architects, it includes the administration (the Senate building), the Churchill auditorium Building, and the Elyashar Library.

- **Stanley Shalom Zielony Student Union Building** - an activity center for students, student services, commerce, and recreation. It contains the student union offices, restaurants, shops and a bar.

• **Ohel Avraham Synagogue** - an architectural gem planned by Prof. Aaron Kashtan.

In light of the importance of this site in terms of preservation of the buildings, the sites, the scenery, and the trees it contains, the proposal for this area includes a distinct policy which will lead to the reinforcement of the area and of its development as an expression of the ForestCity.

■   Recommendations

a. The development plan of the Campus Center will refer to the restoration of the main lawn, the surrounding facades and building entrances, the paths and stairs surrounding the Campus Center, and the addition of (either temporary or permanent) distinguished street furniture as an identifying mark and a point of reference for the Technion. It will also refer to the following:

  • Properly defining the axis and paths that connect to and through the center – signage, a pavement, and appropriate accessibility provisions.

  • Offering various solutions for informal learning spaces such as individual and group tables, power outlets, and wireless internet networks to afford students an opportunity to collaborate and internalize what was learnt in class.

  • Conserving and regulating vegetation and trees along the paths, and rest areas to bolster the campus' 'green' forest campus image.

  • Redefining the borders of the Main Lawn to create a unique character of its physical setting.

  • Revitalizing existing borders by expanding trade activities, recreation, and informal learning beyond the walls of existing buildings.

  • Highlighting the entrances to buildings by signage and information, lighting, seating, shade and solutions for shelter from the rain.

b. A point person will be in charge of managing and maintaining the public space on campus, including the Main Lawn.

The Technion Gates

The most direct link between the Technion and the neighboring cities, Haifa and Nesher, is through the existing main gates – Susan and David Wilstein Neve Sha'anan Gate and the Clara Franziska Mertens Nesher Gate. These gates are currently being restored according to a plan that won the 2014 gate planning competition. The gates' development is designed to create a welcoming experience and to facilitate efficient entry by separating traffic types:

- Buses on service lines and other buses
- Authorized private vehicles (no security check needed)
- Unauthorized private vehicles (security check needed)

Due to current security restrictions, most of the campus is gated by a fence. It is highly recommended that the fence will be removed for optimal integration in the surrounding urban fabric.

Until the fence is removed (in accordance with relevant regulations), it is highly recommended that new gates will be opened up.

The plan TechCity21 also considers the future cable car stations as new inviting entrances.

■   Recommendations

a. The Susan and David Wilstein Neve Sha'anan Gate and Clara Franziska Mertens Nesher Gate will be developed according to the above mentioned plan.

b. The two other existing gates will be renovated to better suite pedestrians and cyclists.

c. The development of the gates' roads will emphasize their forest character by the planting of new trees and the provision of a wide pedestrian lane.

d. New gates will be opened up:

- New Northern and Southern gates will be planned in accordance with future plans for Haifa and Nesher. These gates will enable combined entrance of vehicles, pedestrians, and bicycles.
- Additional pedestrians and bicycles gates will be developed for existing and future neighborhoods as they evolve. These include two gates to link the Ramat Alon neighborhood with the Stanley Shalom Zielony graduate village and with ATS Dormitories through Nahal Ben Dor, and two gates to link Neve Sha'anan to the Gross swimming pool area and to the Canada Dormitories.

Pedestrian bridge at the
Clara Franziska Mertens Nesher gate
(Schwartz Besnosoff Architects with Studio Rolka)

Pedestrian bridge at the
Susan and David Wilstein Neve Sha'anan gate
(Schwartz Besnosoff Architects with Studio Rolka)

Future cable-car line and station

Open space at the the Eastern Station (Illustration)

The Future Cable Car Stations

The plan considers the future cable car stations as additional gateways to the Technion and a focal point for Technion users, visitors and passersby, primarily for Nesher residents who live by the campus – and close the future station D.

■   Recommendations

The Eastern Station (Station D)

a. The station area will be developed as a central meeting place which includes outdoor furniture and commerce services such as coffee shops and small academic oriented shops (such as book and office supply shops).

b. The station area will serve as an "accessibility" junction offering both regular and electric bicycle rental, charging stations, lockers, and devices that will facilitate orientation and accessibility such as a map, bulletin boards, and screens.

c. In general, new construction will replace buildings that are designated to be demolished in order to enable the district landscape preservation (The eastern development district).

The Forest Station (Station E)

a. As of now (2015), this station is designed as a service and storage station not allowing passengers drop off or pick up.

b. It is recommended to promote the use of this station as a passenger station that will establish an internal connection from Station D to Station E to benefit the Zielony graduate village and existing and future construction in the Canada Bulding, for the benefit of hikers in the Technion Woods, and to reinforce the connection with the University of Haifa.

c. When developing this station, as many additional infrastructure facilities will be incorporated as possible to minimize disturbance to the Technion Woods.

East district development (Illustration)

Chapter 4: **Urban and Landscape Design Guidelines**

This chapter presents guidelines for campus building, design and landscaping and its link to the surroundings urban and open space environments. The guidelines refer to new construction as well as to re-use, adaptation, and renovation of existing structures and landscapes.

Additions and retrofit of valuable buildings should be prioritized over new construction.

To the greatest possible extent, new construction will avoid damaging existing trees and clusters of trees throughout the campus.

New Developments, Demolitions, Renovation, Retro-Fit and Re-Use

a. In general, buildings that are of little value (architectural or other) according to the preservation guidelines will be demolished.

b. Building that possess architectural or other value according to preservation guidelines will preferably be retro-fitted and re-used.

c. In such cases, their renovation will include earthquake reinforcement; shelter arrangements, climatic adaptation, energy conservation, and accessibility improvements.

d. Mixed used development will be preferred as detailed above. Measures will be taken to avoid conflict between different uses and to induce efficient use of common spaces and services.

e. Ground floors will be opened up and used as common-public spaces. This will be achieved, among other methods, by adding entrances and transparency.

Distribution of New Developments

a. New buildings will preferably be constructed on disturbed areas (such as existing parking lots).

b. The total campus area covered by buildings and infrastructure will not exceed 580,000 sqm. (This will maintain a 40% - 60% ratio between disturbed and non-disturbed areas).

c. There will be preference for converting campus parking to underground parking.

Urban Design Principles

a. The land cover of each building will not exceed 3,000 sqm.

b. The building heights will not be less than 4-5 floors high.

c. The open space between buildings will be at least 10 meters along topography lines, at least 20 meters perpendicular to topography lines, and at least 10 meters between buildings and roads.

d. Elevators and bridges will be developed in order to increase accessibility.

Efficient Land Use

a. There will be high preference for underground development which can be used for parking, storage, technical services, auditoriums and more.

b. In general, parking and service systems will be placed underground.

c. In general, roofs will be developed as green, accessible roofs in balance with building systems and laboratory needs.

Architectural Design

a. Retrofit of buildings that were identified to obtain architectural or other value would need the preparation of a thorough architectural analysis with respect to their values. This will be done according to the preservation guidelines.

b. New buildings will use cutting edge design and building technologies to represent innovation and excellence.

c. The design should express:

- The technologies used
- Integration into the surrounding landscape
- The ForestCity image
- The architectural and landscape heritage of the campus.

Indoors and Outdoors Interface

a. In general, the building themselves, new and existing, will be developed to mediate between the height differences of the campus topography.

b. In every new development, common spaces will be developed as part of the campus open space network.

c. Landscaping will avoid interfering with the continuum of open space and free and flexible movement on campus.

d. Indoor common spaces will be well-connected with the outdoor surroundings and naturally lit and ventilated.

High-Rise developments

Visual analysis from various viewpoints in and around the Technion demonstrated that building up to 35 meters high well integrates into the natural topography and treescape of the campus and the surrounding urban fabric. Nevertheless, this plan proposes limited development of high-rise buildings, in five nodes that will serve as orientation landmarks.

The high-rise nodes will be laid out in crescent shape facing the bay area.

■ Recommendations

a. Maximum height will not exceed 70 meters (17-23 floors high).

b. The total build space of high-rise building will not exceed 190,000 sqm.

c. High-rise building will be developed on the five predetermined nodes around the campus.

### The Development of Public Spaces

The plan aims to reinforce the exterior public sphere and the atmosphere of universality within the buildings, especially on floors close to the ground, as part of a unified, lively, active public system.

The plan also recommends promoting a variety of public spheres and increasing their diversity and creativity with the use of color, furniture, games, and recreation areas to meet the ever changing needs of studying, relaxing, inspiration, and rest.

■ Recommendations

a. All public spheres on campus will be developed with an emphasis on outdoor time, group gatherings, leisure, and study. Solutions will be provided for the use of a variety of outdoor furniture, as well as a place to rest for a diverse population (benches, tables, hammocks, couches, charging stations, internet, etc.).

b. The scope of the required public sphere and its location will be examined within the plan of every proposed project while addresses the following points:

In areas slated for academia development, public spaces will be planned with reference to buildings entrances that will serve small and medium group gatherings.
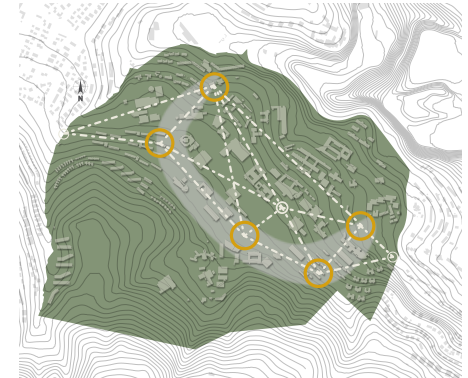
High-Rise development nodes

Simulation of high-rise development

In areas slated for mix-use developments, emphasis will be placed on combining welfare uses. Solutions will guarantee efficient use of spaces, shares facilities and ground floors.

Buildings roofs will be used as public spaces (subject to infrastructure limitations) including community gardens operated by students (in conjuncture with TSA - the Technion Student Association).

c. Every new building area will advance the development of common public spaces that will comprise the public space network and will serve the districts residents and users in particular. These spaces could also serve as vertical connections between surrounding public spaces.

Signage and orientation

The campus layout and topography are among the greatest challenges in campus orientation. The realm of the campus is permeated by many circulation systems, paths, roads, and different building recognition data like building name and function.

Development of a distinct and efficient multi-lingual navigation system, well integrated into the landscape, will not only enhance the campus experience but will also activate the landscape itself as a tool for learning, a scientific laboratory, and a socially active public sphere.

■ Recommendations

Improving orientation throughout the campus will be expressed both in terms of navigation to the campus, and in navigation to the assigned buildings. Navigation will be performed within the comprehensive 'Familiarity and Orientation Plan,' which will assign a design language and a language to relay content throughout the campus.

a. Signage will target a variety of communities with various needs, and a variety of traffic (car, foot, or bicycle).

b. Signage will be positioned in exposed and observed locations, preferably in areas near traffic or main entrances.

c. The layout of the signage will be designed on a varied scale, and with a diverse resolution of information.

d. The layout of the signage will be adapted to planning areas, and will be differential to space and districts such as: gates, campus center, dormitories areas, the Technion woods and the future cable car stations.

e. Signage will refer to the ForestCity image, and will emphasize also the botanical and scenic qualities on campus.

Accessible information systems will be developed such as:

Interior and exterior navigation and orientation signage system, including voice signage system. A touch-sensitive 3D maps.

On-line accessibility – Incorporating information regarding services for the disabled including accessibility maps in a prominent location on the Technion website.

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Lighting

Lighting systems are the core component of the creation of an experience. Lighting helps define the types of activities that are provided within a given space. It will be used to emphasize certain spots, to create a pleasant atmosphere, and will be key in improving accessibility and a sense of safety.

Additionally, lighting systems will be brought in line with modern standards of energy efficiency in an effort to reduce campus energy consumption and to serve as an example in the sustainable implementation of green solutions throughout the campus.

■ Recommendations

The campus lighting will be planned within a comprehensive outdoor lightening plan. The plan will determine lighting methods related to various planning spaces, efficiency considerations and with a desire to make outdoor spaces safe and accessible after dark. The plan will emphasize:

Using light as a significant component in the creation of the campus experience, emphasizing the creation of clear, unique 'spaces' on campus.

Personal security, road safety, and safe, pleasant, ease of movement in the space. As a rule, an effort will be made to ensure that the type of lighting to be used will be planned to uniformly light platforms and objects that are important to spot (such as staircases, clear marking of paths), and will prevent the discomfort of direct lighting (while adapting to blind and visually impaired populations).

'Smart lighting' – consideration of environmental concerns and energy efficiency with solar lighting.

Preservation of the Built and Landscape Heritage

The Technion Campus was planned in the early fifties, and today contains a wealth of historically and architecturally valuable buildings and landscapes which together constitute the Technion's cultural heritage.

As stated above, the campus was developed according to a master plan drawn up in 1952 by Prof. Alexander Klein. Klein's plan is the Technion campus' most significant historic and architectural asset, and many of its features are still present in the fabric of the campus, as are the campus' first buildings that were built during the intense development phase of 1952-1965. Most of these early buildings are historically and architecturally significant in their own right.

During the 1960's, the Technion commissioned a new master plan from Arch. Shlomo Gilaad, aimed at updating the approach to circulation within the campus. Varying from Klein's plan, the new plan proposed to re-orient the campus around a dense and urban horizontal thruway as the central axis of the campus. Development on campus from 1965 and until the early 1980's adhered to Gilaad's concept.

The Technion Campus today is in large the product of these two plans combined.

■ Goals

a. Re-linking future development to the concepts which historically underlay the campus design (as well as most its development) is an essential step in the process of creating sustainable connections between the campus' different parts. These concepts have been identified as follows:

2. The Sherman Forum as gateway and focal point of the campus.

3. Topographically aligned development.

4. Segregation of circulation systems:

- The green vertical axis- an open strip of landscape which serves as visual orientation, pedestrian circulation corridor, and green lung.
- Circular ring road for vehicular traffic.
- Urban horizontal main pedestrian axis.

b. It is preferred that the campus development will maintain and strengthen the principles outlined by the two enmeshed plans (Klein's plan in particular) and to maximize their potential by applying these principles to new development on campus.

c. A group of buildings and landscapes which manifest the historic characteristics of Klein's and Gilaad's plans were identified, and will be surveyed in order to establish their values as cultural heritage sites.

d. The cultural values of campus sites will be examined and graded according to the following criteria: historical context, urban setting in relation to the historic campus schemes, architectural qualities, state of conservation.

e. The survey will be the basis for defining the sites to be included in the Technion Campus Heritage List. A site which was surveyed and graded as having low cultural value will not be included in the list.

f. The conservation policy applied to the sites included on the Technion Campus Heritage List will be differential, and will allow a range of intervention levels, providing instructions for future development, extensions, refurbishments and upgrading according to the grades listed below:

- **Grade I (***)** - A site with exceptionally high cultural heritage values on all criteria. The site's values as manifest in its spatial context, external elevations, internal spaces and architectural details will be conserved. All intervention, including routine maintenance, will require the preparation of a full documentation report as a preliminary step. Major intervention will not be permitted.

- **Grade 2 (**)** - A site with high cultural heritage values on one or more criteria. The site's values as manifest in its spatial context, external elevations, internal spaces and architectural details will be conserved. All intervention, including routine maintenance, will aspire to conserve and enhance the site's values, and will require the preparation of a full documentation report as a preliminary step. Proposed intervention will be evaluated against the findings of the documentation report.

- **Grade 3** (*) - A site with cultural heritage values relating in particular to its historical context or urban setting in the historic campus. Major intervention will require partial documentation as a basis for deciding whether the building need be included on the Technion Campus Heritage List, and the extent of permitted intervention.

g. The Technion Campus Heritage List will include trees, buildings, gardens, groups of buildings and landscape units. All these will be addressed and treated according to the plan's instructions.

h. In order to conserve the scenery of the campus, as well as the concept of landscape integrated development, the state of existing trees must be examined, and clear instructions given as to the nature of future planting. Locations and layouts of future development, both construction and landscape, must take into account the existing topography and slopes.

■ Recommendations

a. The framework of the plan includes a list of buildings, landscapes, trees, as well as clusters of buildings and trees for preservation. These will be addressed in accordance with preservation guidelines that will be determined in an appendix on preservation.

b. Preservation guidelines will be differential and as a rule, will prevent development, construction, expansion, or adaptation of buildings for only a small number of buildings.

c. In order to create a sustainable connection between the various sections of the campus, it is important to reconnect with the schema that led to the initial development of the campus space. In the campus' future development, it is vital to strive to preserve the skeleton proposed by Klein's plan for full recognition of all its principles, to reinforce its strengths, and to utilize its potential through the application of its planning principles on the future construction and development of the campus.

d. In order to preserve the landscape of the campus and the concept of construction that is integrated in the landscape, it is important to examine the condition of the existing trees, and to offer clear guidelines as to the character of future planting. It is important to identify the desired locations for condensing construction/development of land, and to consider the existing slopes when setting up future construction.

The 3D Model

A 3D-parameter model was prepared for TechCity21, which includes all the existing and projected developments on campus. This model intends to serve as a dynamic tool for future planning and for its evaluation. The model can be used to examine new projects and to present them to the Technion users, the general public, and to the planning authorities.

Prior to requesting a new construction/additional construction permit, the suggested construction will be integrated in the 3D model in order to examine its significance in relation to recommendations stated in this plan and the impact on its environment.

Once built, simulations of the new buildings and building additions will be integrated as they were built in the model, in a manner that will keep it updated, and will serve as a long term work tool.

The model can be viewed on any desktop computer, and will be accessible online. In addition, the model is exhibited in the visualization laboratory, The "VizLab" in the Faculty of Architecture and Town Planning.

Illustration of the 3D model

Chapter 5: **Teaching, Research and Innovation**

The following chapters - Academia, Dormitories, Community and Welfare - articulate design principles and specific recommendations. As previously described, the plan recommends to blur the distinction between these uses and combine them within buildings and districts.

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Learning Spaces

New pedagogical approaches, technological developments, and increasing global competition pose new challenges to academic institutions and transform many of their needs.

The plan aims to encourage a flexible academic environment that includes a variety of classrooms, auditoriums, and informal learning spaces to enable a multitude of opportunities for individual and group work. It combines the interior and the exterior into one learning environment that fosters intellectual activity throughout the campus by supplying necessary technology and meeting opportunities.

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Formal Learning – Classrooms and Teaching Laboratories

Over the years, learning methods and technologies have changed dramatically. Traditional classrooms, auditoriums, teaching labs and libraries are gradually becoming less formal, more flexible and far better equipped. Technological aids impact frontal teaching modes and new models of distant and virtual learning are being developed. This enables more individual and group work focusing on the learning experience and on the active involvement of students and faculty. This trend should continue to produce even less formal, more flexible, and far better equipped learning facilities, many of them through the opening up and retrofitting of existing buildings.

The scope of individual learning based on private computers and cellular applications is constantly expanding, and involves advanced teaching methods like simulations, self-tests, and self-learning.

While the total increase in teaching and learning space is expected to be minor, its quality and functioning should continue to change.

Public learning enviroment (illustration)

■ Recommendations

a. In new structures the design of the classrooms will be flexible and dynamic, enabling movement within the spaces and of the spaces themselves.

b. Classrooms will be fully equipped to allow the use of audio visual and CT advancing systems.

c. Auditoriums and special spaces will be adapted for integrative, varied and evolving needs.

d. A survey of the existing teaching facilities will be conducted. The survey will serve as a base for a multiannual upgrade plan that will refer to the following needs:

- Flexibility of use and evolution over time
- Advanced teaching aids
- Accessibility
- Aesthetic and acoustic quality
- Interior-exterior connection
- Balance between formal and informal
- Efficient use - daily, weekly, all year long.

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Informal Learning

Changes in teaching and learning methodologies create a situation in which a significant portion of learning does not take place in formal learning spaces – classrooms and auditoriums – but rather in informal ones – seating areas, cafeterias, and libraries. The use of computer labs is also minimized, since more and more students currently use their personal laptops. However, there is a growing need for screens and for means of collaboration and communication.

The program strives to enhance the informal learning spaces on campus, both by using existing spaces and by developing new learning spaces – inside and outside the buildings, as well as combining existing library spaces and adapting existing spaces as new individual and group learning sites.

There are multiple and varied public open spaces on campus (existing and planned). As a factor in the inherent advantages of the campus being situated in a forest, the plan recommends using some of the outdoor spaces for informal learning for individuals and groups.

■ Indoor Spaces - Recommendations

a. A survey will be conducted to assess and map the function and utilization potentials of

existing informal learning spaces (such as re-adjusting existing libraries, combining libraries and re-adjusting them into learning spaces).

b. Furniture and seating areas will be added to the faculties, which will provide space for laptops, electricity outlets, and Wi-Fi connectivity.

c. The option of creating conference rooms and personal spaces in both existing and new buildings will be examined, for the benefit of students as well as researchers.

- Outdoor Spaces - Recommendations

a. Suitable furniture will be spread around the open space for informal learning. The furniture will be distributed across shaded areas and will include ergonomically suited tables and chairs for working with computers, textbooks and writing materials. These outdoor spaces will include:

b. Charging stations in the informal learning areas.

c. Suitable lighting for evening studies in the open space.

Campus Services and Facilities

The anticipated establishing of the Support Center for Students with Disabilities (2015/2016) should better respond to accessibility and other needs as they arise. It is recommended that the center will:

Initiate and monitor the implementation of the accessibility regulation and standards and the application of the Universal Design policy on campus.

The Campus as a Laboratory

Aside from the numerous designated research facilities and laboratories on campus, the plan sees the entire campus as a laboratory –the Gutwirth Ecological Garden and Upper Technion Woods are two of many areas that have been opened up for students and for the general public, as outdoor laboratories.

Higher education campuses boast a variety of open spaces, outdoor experimental spaces, and laboratories used for educational purposes. These include greenhouses, teaching and research forests, agricultural and ecological experiment stations, student gardens, multi-use campus forests, and engineering projects on campus grounds. However, due to campus management

considerations, administration, funding, and the security of conducting the projects themselves, these valuable campus grounds rich in educational potential are frequently only used by a single department and are often closed or unknown to the broader campus community.

Promoting multi-purpose outdoor spaces that create platforms for interdisciplinary research as well as a space for the broader community to learn and create.

Research and Teaching Laboratories

Research and academic laboratories are the engines for the development of technological and scientific knowledge. A supply of high standard, state-of-the-art research laboratories is essential for the campus' ability to attract excellent researchers and to develop cutting edge research.

■ Recommendations

The Technion admits 20-30 researchers per year; these researchers require new laboratories in existing or new buildings. The plan suggests increasing the gross space of the research laboratory (to an average of 80 sqm.) according to evolving needs in every field. Thus in order to comply with up-to-date standards and to respond to projected increase in research student, fellows and faculty and in international joint ventures.

- There will be preference for developing multidisciplinary research buildings.
- There will be preference for developing interdepartmental equipment, research infrastructure, and core equipment, to provide service for a number of units (core facilities). Naturally, these will attract various multidisciplinary researchers, and groups. Therefore, such facilities will be developed to encourage interaction, synergies and innovation.
- Existing buildings will be adapted as much as possible to designate work areas for emeritus professors and graduate students.
- Animals facilities will be establiched under the AAALAC International accreditation program.
- Optimizing direct costs – improving laboratory efficiency, increasing output, reducing materials and consumed supplies. This will be performed by streamlining work procedures, clearing out office supplies and potential infrastructures (like coolers) to common areas, practical furniture, enhanced use of natural light, light fixtures, improved acoustics, introducing the transparency aspect of 'science on display.'

- **Optimizing indirect costs** – administration, communication, finance, etc. It is recommended to reduce the use of personal laboratories and to switch to communal laboratories and communal use of resources.
- **Energy savings** – Beyond the reduction of expensive laboratory spaces, there will be an effort to conserve energy with regards to the rate of air circulation and heat removal. Optional methods:
- **Savings in air circulation** which is measured by an examination of the ACH level according to actual occupancy – control over the speed of air flow.
- **Advanced air cooling systems**.
- **Deep-freeze refrigerators for energy savings**.
- **Reclaimed water** instead of tap water.
- Cooling systems which are based on water rather than gas.
- **Sustainable materials** in laboratory such as rubber flooring or advanced work surfaces.
- **Sensory lighting systems** to illuminate laboratories with natural light.
- **Advanced glazing** which offers control/shading to contribute to energy savings.
- Closing fume closets.
- Cooperation leading to innovation and creativity – based on open spaces, common use of core facilities, and sharing areas that support laboratories.

Innovation Hubs

The development of knowledge-intensive industries, incubators and collaborations is necessary in the world of an ever changing economy, where the interrelationship between research and development is intensifying. It is projected to contribute to both academic research and civic development. Furthermore, it will allow the Technion additional funding resources and develop the campus independently of external/governmental funding sources. Similar innovation hubs are established in the world's leading research and academic institutions. The establishment and reinforcement of such hubs in the Technion will contribute to its status and academic prestige.

The combination of innovative companies with ongoing academic activity, particularly in technological universities such as the Technion, is an excellent tool for developing technological innovation and fueling both academic research and teaching

The innovation hubs will assist young researchers and entrepreneurs to establish and integrate their companies in Israel's Hi-tech industry. The hubs are designed for entrepreneurs who are Technion students, faculty and alumni. They are also targeted to attract companies at the incubation stage of their activity which need the existing Technion infrastructures and assistance in commercializing their knowledge. The hubs will serve them until the prototype stage, and will accommodate up to 50 small companies of 2-10 employees apiece.

The core planned activities inside an innovation hubs are: basic research, prototype development, and technology implementation for products or services. The companies operating in the innovation hubs will initially be of an extremely thin structure, and will develop over time. Therefore, the option of their development inside the campus until the production phase should be maintained. Companies will spend no more than three years in the Innovation hubs to provide the opportunity to new companies to integrate, thus maintaining the entrepreneurial character of the hubs.

The employment compound's target and functional role is aiding commercializing researchers' knowledge, including:

- Providing basic services and infrastructure for research management
- Supporting new company's administrative management
- Assisting fundraising
- Assisting and initiating collaborations between companies, academic and governmental institutions
- Assisting in legalization processes of knowledge commercialization
- Integrating industry alongside researchers
- **The Innovation hubs suggested core fields of operation**: Life sciences, IT, Computer technologies, Nano, Materials

■ Goals and objectives

Empirical research suggests that the ability to develop an affinity between the academic institution and the companies operating alongside it (or within its campus) is the key factor for the scientific hubs success (Westhead & Batstone, 1998; Goldstein & Luger, 1992). Furthermore, empirical research conducted in the Netherlands and in the UK suggests that the hubs main role is to nurture social capital as a basis for the development of entrepreneurship

and social networks (Hansson et al., 2005). Based on these conclusions, the following goals and objectives were established:

a. Intensify academia-industry connection through scientific, research, educational and technological activities:
  - Hold two annual research conventions together with the companies operating within the innovation hubs.
  - Create five collaborations a year between academia and the hubs' companies (laboratories, infrastructures, projects, conventions, etc.).
  - Incorporate 15 Masters and Doctoral students a year whose research and development activities are performed within the innovation hubs.

b. Assist the Technion's students, faculty and alumni to commercialize their unique knowledge by establishing companies, and going through the organizational phases (fundraising, collaborations, staff recruitment, etc.).
  - Recruit 10-20 Million NIS per year from investors in the companies (new and old) within the innovation hubs.

c. Create jobs and employment opportunities for Technion students and alumni
  - Incorporate 20 Technion students and alumni in the hub's companies every year.

■ Recommendations

a. The existing areas designated as innovation space will be expanded to include 45,000 sqm. in a manner that would facilitate annual collaboration between academia and companies (labs, infrastructures, projects, conventions and so forth).

b. The maximum capacity of the innovation hubs will be 50 companies with 2-10 employees.

c. Spaces of about 300 sqm. will be allocated to a company in its highest development stage before leaving the hubs and becoming an established and productive company. Overall, the floor space will include office space, work areas, administration and other services such as: common/floor administrative office, printing and copying rooms, dining areas, parking areas, etc.

d. It is assumed that people coming to the hubs will require expensive research and development infrastructures, which they won't be able to build on their own at in the company's infancy. Therefore, the following infrastructures should be included:
  - Use of mainly existing laboratories, clean rooms and laboratories spaces.

- A law firm specializing in knowledge commercialization – as part of the office spaces.
- A branch of a large accounting firm – as part of the office space.
- Meeting / conference rooms for inter-organizational purposes.
- Meeting / conference rooms for cultivating connections with potential investors
- Dining options and coffee shops.

e. The Technion administration will examine the suitable place for the development of innovation hubs and facilities.

Chapter 6: **Dormitories**

Dormitories Development

Currently, there are about 9,500 undergraduate students in the Technion, about 4,100 graduate students (studying for master and doctoral degrees), about 3,200 practical engineering and the pre-university education students, and about 480 students in the International School.

These Students and junior faculty members enjoy 3,877 housing solutions: 3,263 single beds and 614 couples' residencies.

According to the above mentioned program, the number of undergraduates is not expected to rise. On the other hand, there is a projected increase of up to 5,000 advanced degree students, an increase of up to 4,500 in the pre-university education and practical engineering students, and an increase of up to 1,000 students in the international school. An additional increase is projected among faculty members.

The plan strives to significantly expand the dormitories in TechCity21 and in the neighboring cities of Haifa and Nesher. It sets a goal of one bed per student, with half of these beds to be built in the Technion, and the other half in its neighboring cities.

The plan recommends significantly expanding the dormitories for graduate, international, practical engineering, and pre-university education students, thus adding young, mostly singles, population, as well as young families. The additional families will require additional welfare and public services.

Dormitories development would also contribute to the national effort of increasing affordable housing supply. This means that rent level should be kept affordable for student and faculty members.

The plan also aims to upgrade the dormitories quality in both existing and new dormitory buildings and to meet international standards by:

• Encouraging mixed use dormitory developments to facilitate "a live-work-play" environment.

• Expanding the variety of 'living environments' on campus; such as expanding the Zielony graduate village to create a 'forest living' experience on the one hand and developing (mainly single) dormitories in the campus center to revive this area in all hours of the day on the other.

- Developing common "smart" spaces to encourage learning, interaction, recreation, and supplying the necessary services.

■   Additional Dormitories

- 50% of new Technion students will have housing solutions for the entire period of their studies.
- 50% of faculty members will have housing solutions on campus for their first few years of employment.
- 50% of practical engineering school and pre-university education students will have housing solutions on campus for the entire period of their studies.

■   Calculating Dormitories additions

- 50% of student will be living on campus.
- 70% of the masters and PhD students are married.
- 10% of bachelor degree students are married.
- 100% of the international school will be entitled to a room in the dormitories (all single)
- 100% of post-docs will be entitled for dormitories units.
- In the time pace of this plan 100 new faculty members are about to join the Technion.
- 50 units of total 100 sqm. (including service areas) will be developed for them.
- Average number of kids per family in the campus is 0.5.
- Total area for single bed is 25 sqm.

Total area for students' family unit (including service area in the building) is 80 sqm.

Population	Single-bed	Family units	Total Dormitory supply	Total space (sqm.)
50% bachelor degree on campus	4,190	560	4,750	149,550
20% master/ Phd	1,375	875	2,250	104,375
Post-doc + international students	500	500	1,000	52,500
practical engineering school and pre-university education students	375	-	375	9,375
New faculty members	-	50	50	5,000
Total	6,440	1,935	8,375	315,800

Future In-Campus dormitories development

Living on Campus

On-campus residence is conceived to be an integral part of the learning experience, based on the assumption that learning occurs everywhere on campus and at all times.

- ■ Recommendations

a. Flexible planning and use of residences.

b. The Lobby is a center with a coffee shop, classrooms, a media library, a computer lab, an area for group work, fitness areas, lecture halls, and game rooms.

c. Emphasis on sustainability – Light fixtures with movement sensors, heating by solar panels, recycling centers, a laundry room with energy-efficient equipment, etc.

d. Inner institutional communality – An emphasis on 'socialization' between residents and faculty members, allotting extensive public space in the dormitories, kitchenettes, coffee shops, and restaurants

e. Dormitories supply should ensure affordable rent for students and faculty members.

Establishing Dormitories in the City

The Technion will collaborate with the municipalities of Haifa and Nesher according to the agreed upon format, in order to establish dormitories and other housing solutions for the other 50% of students, faculty members, and pre-university education and practical engineering school students in the cities themselves with the regulation of quick and easy access to TechCity21.

Chapter 7: **Community and Welfare** (to be completed)

The Technion is a home for students, faculty and staff. It also hosts visitors from Israel and abroad and citizens from neighboring communities. These, with the increase of activity, especially residential, will require community and welfare services such as dining and cafeteria options, religious services, medical, banking, laundry rooms, community center etc. Many of these services should be available throughout the day/week/year and as such be part of the bridging effort between the campus and the surrounding urban fabric.

Specific guidelines concerning Community and Welfare including sports, retail' catering as well as cultural services and the way they integrate into the urban fabric will be soon completed and added to this plan.

Chapter 8: **Integration with Haifa and Nesher**

The neighborhoods of Haifa and Nesher adjoin the campus and encompass it on all sides: the Neve Sha'anan and Ramat Allon neighborhoods to the west, and the Ben Dor and Ramat Yitzchak neighborhoods of Nesher to the east. This location, between Haifa and Nesher, holds great potential for a reciprocal relationship between academia and other communities, inside and outside of the campus, as is with Hadar historical campus and the Rapaport Faculty of Medicine in Bat- Galim neighborhood.

The plan aims to improve its integration in the surrounding urban and natural environment of Haifa and Nesher, enhancing the bridge between cities and communities; between academia and industry, and between the Carmel Park and the Haifa Bay.

The Technion also aims to contribute to its environments and strengthen the Technion as an urban focal point, an important center for education, research, culture, and enrichment.

The Campus as an Urban Asset

■ Recommendations

The Technion will attempt to:

a. Develop and open up its facilities for the general public (to the greatest extent possible).

b. Develop the Gutwirth Ecological Garden and the Technion Woods as a public leisure and recreation area offering research and educational opportunities for the general public.

c. Examine the possibility of using its existing academic infrastructures (such as libraries, classrooms and its computer labs) for the general public benefits.

d. Develop further public centers to expose the Technion activities, research and innovation to the general public (such as the now-renovated Coler visitors center).

The Physical Links

■ Recommendations

a. The Technion Gates: The Technion is currently upgrading the Susan and David Wilstein Neve Sha'anan Gate and Clara Franziska Mertens Nesher Gate as the campus main entrances.

This upgrade is projected to greatly improve access to and from the campus, mainly for pedestrians and cyclists. As stated above, the plan recommends the removal of the existing campus fence. Until that time (if feasible), additional gates will be developed..

b. The Technion will collaborate with Haifa and Nesher municipalities to reinforce, to the greatest extent possible, the scenic connection between the campus and its surrounding to create a scenic continuum similar to the planned Science Avenue.

c. The Technion will collaborate with Haifa and Nesher municipalities to develop the adjacent areas.

d. As described above, the Technion will attempt to enhance in-campus pathways and avenues to create a continuum and accessible connections for pedestrians and cyclists from the different gates to the campus and to the future cable car stations.

e. The Technion will attempt to develop the future cable car stations as an inviting and welcoming hub for the general public inside the campus.

f. The Technion woods and urban landscape of TechCity21 will be open to the local population as part of the sustainability and ecological concept for developing and maintaining the campus.

Urban Integration

■ Recommendations

a. The housing policy determined by this plan calls for developing half of the new dormitories at the Technion, with the other half in Haifa and Nesher. Together these efforts should meet the goal of providing a bed for all students and faculty members.

b. As described above, the Technion will collaborate with Haifa and Nesher municipalities to implement the Technion's housing policy to develop city dormitories and the necessary arrangements services (such as marketing and adequate transportation).

Education, Participation and Social Engagement

■ Recommendations

The Technion will attempt to:

a. Reinforce cultural, scientific and educational activities for the general public on campus.

b. Promote off-campus scientific and educational activities in places including: community centers, schools, nursing homes and dormitories, with an emphasis on young people, retirees and minorities.

c. Further develop the exposure of minority groups, ultra-orthodox Jews, women and youth in general to scientific and technological higher education.

d. Develop environmental education programs to increase general environmental awareness and activities.

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Joint Ventures

■   Recommendations

Technion administration will examine the possibility of developing partnerships with Haifa and Nesher municipalities to promote and initiate joint activities and collaboration, including (to the greatest extent possible):

a. Reinforcement of educational, scientific and innovational activities and development of off-campus educational activities

b. Reinforcement of accessibility to the Technion (Including in and to Hadar Historical Campus to the Rappaport medicine faculty).

c. A study will be conducted to examine the possibility to extend the Haifa bay BRT system (Metronit) to connect the Technion campuses and the cities.

d. Reinforcement of voluntary engagement and involvement of staff in municipal, welfare and other projects (such as volunteering in welfare centers).

e. Co-sponsored activities on campus.

f. The 'Techno-Bike' bicycle service.

g. Join the paths on campus with those of the Carmel Forest and to make the Haifa Trail accessible for everyone.

h. Reinforce online internet collaboration in order to provide the public with optimal information about events at the Technion and activities that are open to the general public or taking place in the cities.

Chapter 9: **Accessibility, Mobility and Connectivity**

The Technion campus is located between 2 neighboring cities, Haifa and Nesher, on the sloped hill of Mount Carmel. The mountainous nature of the campus terrain and its neighboring cities means that there are instances where the height difference between two on-campus destinations can be over 80 meters. This proposes a revision of the current transportation system.

In their current state, a two way ring road serves as the primary vehicle circulation infrastructure on campus.

Connectivity, accessibility, and orientation are interrelated and directly impact user preferences and the level of service they get.

The current transport system, difficult pedestrian and bicycle access and the lack of orientation has led to a high level of dependency on private vehicles. This situation causes parking, traffic, and safety problems. The current situation clearly contradicts with the objectives of connectivity, accessibility, and sustainability of this plan.

Implementation of improvements in the public transportation system is an immediate step in making the campus more accessible to foot and bicycle traffic. Rerouting bus traffic and improving the layout of bus stops, while directing them to the heart of student activity are only a first step. This will improve the service and the campus experience of in the short term while also setting up for the future cable car stations.

Improving accessibility, mobility and transportation in and to the campus, is a primary goal and a major challenge.

The plan strives to create a highly accessible environment for everyone without any need for special, separate arrangements and facilities for people with disabilities. The plan is based on the principle of 'universal design' that promotes integral solutions that upgrades the environment for everyone.

Pedestrian traffic on campus - This is a large campus with built-up areas that will double in size in the upcoming years. Already today, the campus is dispersed across large areas so

that the distance between buildings and activities make pedestrian mobility difficult. Added to these issues are the slopes of the campus. A considerable component of pedestrian traffic on campus is performed on improvised winding, contrived paths.

Bicycle traffic - Many students have expressed a desire to arrive and travel by bike, but in the absence of bike trails, parking facilities and showers in the Technion, the use of bicycles is not increasing.

Motor Vehicle traffic to and on campus - Access to the campus by public transportation, mainly from train stations and certainly on foot or by bike, is unsatisfactory, so nearly half of those that come to the campus each day do so by car. Currently, 46% arrive at the Technion in private vehicles (mostly drivers), 29% by public transport, 17% on foot, and 8% by bicycles and other means.

Within the Technion, many people use their private vehicles. The distribution of outdoor parking around the campus, with more parking than the required standard, also contributes to excessive vehicular traffic. However, there is a shortage of parking spaces in areas with high activity such as the campus center and the dormitory areas. The shortage of parking places in main areas of activity creates unwanted traffic searching for available parking, increases air pollution, and overloads the campus roads, especially during peak hours.

The number of parking spaces on campus, 4,879, exceeds the number required by the existing Israeli standard, namely 4,250 parking spaces.

In addition to this traffic, many buses pass through the Technion campus. The existing shuttle service on the Technion ring road does not provide broad enough coverage and its frequency is limited.

Pedestrian traffic

- Reducing internal vehicle traffic and giving priority to pedestrians and non-motor traffic - using in-campus shuttle service, smart parking system including additional bicycle parking, and additional services and applications.
- Many pedestrian networks perpendicular, parallel and diagonal to the lines of the topography have been identified. Developing these networks will allow freedom of movement and range of circulation choices and enable people to get around easily and efficiently.

■   Recommendations

a. Developing paths in line with the ForestCity structural network – offering direct access slopes of up to 4.5°.

b. Adding new pathways and adapting existing pathways to accommodate pedestrians and bicycles.

c. Designing the paths while preserving existing trees.

d. Every new structure, renovated structure, or upgrading of public space should comply with the 'comprehensive accessibility regulations'. Each project should be inspected and approved by an accessibility consultant. Efforts to improve accessibility within and around existing structures and public spaces will include:

- Creation of a continuous, accessible traffic network
- including bus stops and accessible parking, lowered sidewalks, internal door-to-door shuttles
- A continuous pedestrian network, reinforced with passages through buildings in order to overcome topographic barriers.
- Ensuring that accessibility solutions are architecturally cohesive and are well integrated into the landscape

Biking in and around the Campus

Emphasis will be placed on developing comfortable, continuous cycling routes, which will link riders to the Campus Center, the different facilities and main public areas.

Public transportation

The Plan aims to redesign the transportation systems in and around the campus in order to reduce ineffective bus travel while supplying better access to more destinations. In the preliminary stage, bus traffic on the ring road will be redirected to travel clockwise. In this manner, it will be possible to move the stations to the inside of the ring, closer to the major destinations on campus.

Special attention will be paid to better and more direct transportation between the three Haifa campuses: the Hadar historical campus, the Bat Galim Rappaport Faculty of Medicine and the TechCity21 main campus.

Developing the future cable car stations - The eastern cable car station (Station D) is located

in the eastern development districts. It will serve as an additional main gate, an opportunity to modify traffic and accessibility.

This plan also recommends operating the future "upper" cable car station (Station E) as additional passengers' station.

■   Shuttle Buses

The plan aims to improve the existing internal transportation system that covers the ring road, and runs every 15 minutes from 7:45am to 5:45pm with an hour's break from 12:15pm -1:15pm. The improved shuttle bus services will attempt to enable the smart parking system, especially for parking at the campus periphery, in order to remove most of the vehicles from the campus center.

Campus shuttle bus operation

• Smart service customization based on calls/Applications.
• Flexible in rout and in frequency

Motor Vehicle Traffic

The motor vehicle traffic will continue to be based largely on the ring roads. The direction of public transportation on the ring road will be reversed.

To the greatest extent possible, this chapter's principles will be implemented in each new development in order to achieve accessibility and connectivity of all campus districts.

Carpooling

A survey of travel habits, conducted as part of this planning process, shows that most private vehicles arrive at the Technion with only one person (1.1 people per vehicle). The goal is to reach an average of at least 1.5 people per vehicle (i.e. more passengers in each vehicle), higher than the national average. Carpooling will be arranged through one of the well-developed carpooling applications or a new one adapted to TechCity21.

Parking on Campus

The parking policy is based on rationalizing parking on campus, primarily through 'smart parking' system that would enable a more efficient use of existing and new parking and

encourages the use of public transport (including an upgraded shuttle), walking, and both, standard and electric cycling.

Despite the present surplus of approximately 650 parking places according to the current standard, the projected additional construction will require an addition of approximately 2,900 parking spaces beyond the current surplus.

It should be noted that the present surplus parking is largely a theoretical surplus and does not reflect the current parking shortage in central areas. More effective parking management, as proposed, and the widespread use of convenient, flexible shuttle services will allow relief from the current situation as well.

To the greatest possible extent, extra parking will be planned in underground parking lots under buildings or developed areas to provide a solution for upper parking allocated for building establishment and avenue development. In addition, parking racks for bicycles are planned to be positioned at the entrances to buildings.

	Current situation	Currently required according to standard	Addition required according to standard	Total according to standard
Private vehicles	4,879	4,250	2,874	7,753
Supply vehicles	Few		84	84
Bicycles	Few		2,656	2,656

Future Parking development

■ Recommendations

a. New buildings of over 2,000 sqm. will preferably include underground parking. These parking spaces will fill as much as possible the needs of the users of both new building and nearby buildings.

b. Accessible parking spaces will be allocated in accordance with the Disabled Parking Law, 1993, taking into account the following recommendations:

• The number of accessible parking spaces to be allocated in each complex and/or near each building is a function of the number of parking spaces required or assigned in that complex (whichever is greater).

- Some accessible car parking spaces in each area will be allocated to large vehicles, in accordance with relevant regulations.
- Accessible parking spaces will be located closest to the adjacent entrance to the general parking area. Their ascribed location will be given priority over other reserved parking spaces.
- Priority will be given to the location of accessible parking spaces in covered parking lots rather than outdoor areas of the same complex. If an accessible parking spot is allocated to a specific person, it will be in addition to the number of accessible parking spaces required in that complex and will not be counted as part of that sum.

The plan aims to reduce the number of people arriving in private vehicles so that the number of private vehicles entering the Technion will not exceed 35% of the campus population (compared to 43% today).

Assuming that the level of appeal remains similar to the current state, an increase of up to 950,000 sqm. (approximately 300,000 sqm. non-residential and 200,000 sqm. residential) **will draw approximately 1,600 more vehicles to the Technion, for a total of 3,200 vehicles** (one vehicle per 190 sqm.).

Use	Private vehicle parking	Supply/work vehicle	Bicycle parking
Faculty buildings, administration, laboratories, libraries	For every 125sqm. built space	For every 5,000sqm. built space	minimum 1 per 10 students/faculty/staff
Dormitories (Single)	For every 15 bedrooms	0	minimum 1 per 10 rooms
Dormitories (families)	For every unit	0	minimum 1 for every unit
Hubs and offices	For every 40sqm. built space	For every 5,000sqm. built space	According to Technion management decision
Commerce and Dining services	Minimum 1 For every 250sqm. built space. Maximum 1 for every 125sqm. of built space	For every 2,500sqm. built space	1 for every 250sqm. built space

Future parking standard according to use

"Smart Parking"

Online parking system to save time searching for a parking places and to prevent superfluous traffic on campus: Every authorized person arriving in a private vehicle, will park in a parking place assigned to him by the Parking Control system.

Accessibility to all parking spaces on campus: Those parking in remote locations will be able to use internal transportation (shuttle busses) to reach their destination on campus.

Open parking lots to fully utilize parking areas: All campus parking lots will be open (without gates and barriers) and managed by the Parking Control Center.

Service Parking and Deliveries

Access to all buildings for emergency, supply and service vehicles will be arranged and parking spaces for these functions will be designated.

Entry for delivery trucks and their designated parking spaces will be limited so as not to overload the entrances with delivery vehicle traffic.

A mechanism will be set up to enforce this restriction.

Transportation Control

A point person will be in charge of transportation control and ongoing traffic and parking management.

| Vehicles | Public Transport | Pedestrians | Bycicles |

Accessibility, Mobility and Connectivity

Chapter 10: **A Sustainable Campus**

The following chapter sets out goals for positioning the campus as a leader in sustainable campus design and performance. The chapter is divided into two main subjects:

- **Macro aspects of environmental management**, including energy efficiency, water conservation, recycling, waste reduction and treatment, earthquake preparation, campus security vis-à-vis hostile acts, general safety, and hazardous material treatment.
- **Practical applications for promoting a sustainability agenda on campus**, including environmental management, green construction, green open space development, ecological conservation, flora, gardening, irrigation, and environmental education.

General principles and practical guidelines for each sustainability goal are provided in the chapter.

Leadership in Sustainability

We live in an era of unprecedented material wellbeing and population growth, in Israel and across the globe. This has placed previously unknown anthropogenic stresses on the global biosphere. The Technion, as a center of teaching and research excellence, employs scientists that address these phenomena and develop scientific solutions to meet global environmental challenges. More importantly, we are training the scientists and professionals of the future, who will inherit our world, along with its riches and environmental challenges. The Technion believes it has a role as a responsible global citizen to expand its positive impact further through this plan.

In response to growing global and regional environmental challenges, leading universities around the world have adopted environmental strategies that simultaneously improve their environmental performance and emphasize their role as educational and research institutions. The Technion will join this trend and establish itself as a leader in the field. As such, the Technion will strive to demonstrate its responsibility for the campus environmental footprint, to educate our students towards environmental responsibility and leadership, and to play a leading role in environmental research and innovation.

The Technion will adopt the framework of "sustainability" in its approach to environmental

challenges. Sustainability was first defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[1] Today, sustainability increasingly focuses on human livelihoods with the underlying assumption that livelihoods have three inter-related components of wellbeing: economic, social, and environmental. As such, decision making and planning must take a holistic approach and simultaneously consider all three components, rather than employing conventional considerations prioritizing economic benefits and costs over other values. This means developing a campus culture that promotes stewardship, efficiency, economic and social equity and long-term vision. We believe that adopting sustainability provides a key leadership opportunity for a top-tier university, and so this document sets out a path for the Technion to incorporate sustainability values into its decisions and practices.

With sustainability and interconnectedness of social, economic and environmental issues in mind, sustainability policies adopted by universities around the world relate to (in addition to environmental issues) issues such as local economy (e.g. institutional purchasing and investments, employee wages and working conditions), transparency in decision making, and investment in all aspects of human resource development. The Technion's environmental policy will be expressed on five levels:

- Increased attention to environmental impact of the physical campus and its population
- Solutions to reduce the use of natural resources and to reduce waste
- Increased use of renewable energy
- As an academic institution, producing research and innovation, and educating toward environmental responsibility and leadership
- Increased emphasis on a harmonic relationship between the campus community the unique ecology of Mount Carmel

In addition to the environmental goals in this chapter, environmental aspects and considerations have been tightly integrated along this plan. The principles guiding this plan were designed to produce a balance between development and construction needs on the one hand, and on the other, the need to preserve and care for the unique natural environment of the campus.

1   United Nations General Assembly (1987) Report of the World Commission on Environment and Development: Our Common Future. Submitted to the General Assembly as an Annex to document A/42/427 - Development and International Co-operation: Environment. Retrieved on: 2009-02-15.

■ Goals

The Technion will establish itself as a leading university in environmental policy, in Israel and worldwide, and as a sustainable campus, by:

• Preserving and nurturing the unique natural environment in which the campus is situated.
• Striving to become a zero-carbon emissions campus through energy conservation and increased use of renewable energy.
• Drastically reducing the use of non-renewable resources.
• Increasing its role in environmental research and innovation and becoming a global leader in the field.
• Educating students, staff, and faculty members toward environmental leadership and responsibility.

Environmental Management

The Technion will establish a sustainability office as an integral part of its organizational structure, which will oversee all environmental issues and liaison with other campus units concerning related issues. In order to promote these issues, the role of the sustainability office must be clearly defined within the organizational structure, and it must be granted clearly defined areas of authority and provided sufficient resources (human and budgetary) in order to obtain its goals.

The Technion looked to successful precedents in campus sustainability to model its own plans. Many campuses that have adopted sustainability principles have a dedicated sustainability office. The sustainability office works closely with other units, and is usually directed by an administrative committee. Committees are divided into subunits, each with a specific sustainability focus – water, food, buildings, transportation, etc. Sustainable campuses also make significant efforts to publicize the issues and educate the campus community.

■ Goals

• Establishing a new unit with sufficient resources and administrative commitment to oversee all aspects of sustainability – in cooperation with other Technion's units and divisions, including on management, safety, procurement, construction, and infrastructure issues.
• Obtaining and maintaining a recognized green status for the campus by meeting common

standards (including greener-than-ever campus). vis-à-vis the Ministry of Environmental Protection, and in accordance with its guidelines.

■ Recommendations

This sustainability office will deal, among other issues, with the following:

Future missions of the Sustainability office

Subject	Details	Requirements
Appointing an on campus environment Committee	Active sustainability forum responsible for implementing policy to meet this plan environmental goals and promote sustainability and environmental issues on campus (includes both voluntary and paid positions)	Management decision, budget and appointments
Resources agglomeration among Technion's units	Optimal use of resources (for example, collective management of rooms and spaces to minimize need for new classrooms, meeting rooms, multimedia rooms, etc.).	Management decision and establishment of a resource management system (SAP, Outlook, or an independent platform)
Implementing green procurement principles in institutional tender processes	Preference for local production and for environmentally-friendly and equitably manufactured products, considering products lifecycle, and emphasis on reducing packaging material	Management decision and cooperation with Procurement division
Controlling and monitoring polluting factors	Managing a transparent and comprehensive system of hazardous materials in which information will be available to campus users	Cooperation with other units such as the safety unit and the Construction and Maintenance Division.
Ongoing monitoring and enforcement of environmental issues throughout the campus	Particular emphasis on monitoring of waste and recycling, water use and effluent quality, air pollution, energy use, transportation characteristics, fuel use, and gas use. Registering and following up on periodic efficiency tests.	Cooperation with Construction and Maintenance Division and allocation of HR and technological resources such as BIM and POE
Implementation of a green construction code (new buildings and repairs)	The Technion will commit to meeting the 5281 standard for green building (or similar standard) for new building, as well as for renovation of existing buildings, whenever repairs or improvements are carried out	Management decision and cooperation with Construction and Maintenance Division.

Subject	Details	Requirements
Implementing green builsing code in campus open areas	Meet for green infrastructure and landscaping standards (such as 'Envision').	Management decision and cooperation with Construction and Maintenance Division.
Aspiring for a zero-carbon emissions campus.	Developing policy for reducing carbon emissions and concentrating energy production on campus; monitoring, oversight, measuring efficiency improvements	
Introducing environmental and sustainability considerations to every new construction project on campus	Involving suitable environmental consultant on every project promoted	Management decision and cooperation with Construction and Maintenance Division Sustainable office director will be a member of the Physical Development committee
Ecological monitoring and management of the Technion Woods and the Gutwirth Ecological Garden	Monitoring of biodiversity and ecosystem services, nurturing these values, exploring the uses of the forest in order to conserve it and develop it as a significant center for education, recreation and biodiversity conservation	Implementing the ForestCity image, enhancing the Technion woods and the campus wide ecological plan; assignment of administrative responsibility and necessary budget for implementation.
Establishing partnerships with campuses in Israel and abroad, participating in international activities to promote sustainability and to share knowledge and experience	Joining inter-university networks of green campuses, for idea sharing and mutual promotion of sustainability principles.	Budget and HR allocation

Subject	Details	Requirements
Publicity and education toward environmental leadership and increased awareness, and for energy efficiency	Responsibility for projects and study programs to increase awareness; for PR efforts and work with students, the student union, faculty members, and employees; education and courses on environmental issues, both as part of academic studies and open to the general public; collaborations among Technion faculties and with other institutions in Israel and abroad	Budget and HR allocation, cooperation with Technion public relations offices, classrooms for courses and programs
Cooperation with Haifa and Nesher local authorities to promote environmental policies	Running joint projects with the Haifa and Nesher local authorities, schools, and more; coordination concerning planning issues, the bay area, ecological considerations	Budget and HR allocation

Efficient, Carbon Free Energy Use

In 2013, the Technion used 80 million kWh of electricity. Electricity consumption rises every year, in part as a result of the expansion of built-up areas on the campus, and also due the construction and operation of high energy-demanding laboratories. For several years, the Technion has taken steps to promote energy efficiency on campus, led by an energy efficiency forum and supported by Green Campus. To date these activities have resulted in significant improvements in energy efficiency (with an emphasis on 11 faculties and units).

The Technion has participated in voluntary reporting of greenhouse gas emissions over the last three years, since the mechanism was launched as part of a national campaign.

■ Goals

The Technion is setting two long-term energy related goals. First, we will create a net zero-carbon-emissions campus. Second, we will create an energy-balanced campus - one whose production energy production is identical to its energy consumption.

■ Goals toward achieving zero emissions:

• By 2025 – 10% reduction in electricity consumption.
• By 2035 – 20% reduction in electricity consumption.
• From 2035 – according to energy reduction trends in Israel and worldwide.

■ Energy production on campus:

- By 2025 – 5% of electricity consumption
- By 2035 – 10% of electricity consumption
- From 2035 – according to energy reduction trends in Israel and worldwide.

■ Main recommendations

a. A comprehensive energy efficiency plan should be prepared as part of a set of activities for meeting quantified targets and deadlines.

b. Ongoing preparation of a yearly plan to reduce overall electricity consumption, integrating use of incentives and Ministry of Energy directives to encourage concrete efficiency steps.

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Water

■ Runoff water

There are two main aspects to water management on campus: First, managing runoff water within the campus (e.g. through the use of tools to encourage infiltration and reduce runoff, creation of water retention ponds, preventing the proliferation of pollutants into water and assuring general water quality, and using runoff water to replenish groundwater); second, managing water use on campus, including efficient use of fresh water and the use of grey water.

■ Goals

a. The Technion will act to maximize water infiltration, use of runoff water and use of recycled (grey) water on campus.

b. The Technion will work to rehabilitate the riverbeds within the campus, and to restore natural drainage systems.

c. The Technion will encourage water conservation in campus buildings and gardens.

■ Main Recommendations

Hydrology and runoff water management:

- Rehabilitation of the Nachal Ben-Dor riverbed, and planning open spaces that will be added throughout the campus to manage runoff water through the campus.
- Using landscaping solutions for runoff management in all new projects throughout the

campus, additional runoff generated from planned construction is offset by landscaping of other areas to decrease runoff, such that there is no net increase in runoff leakage from the campus.

■ Water Conservation

Main Recommendations

a. Preparing a detailed action plan for water conservation that will include recommendations for the adoption of appropriate technologies in campus buildings.

b. Establishing a system for water conservation and grey water use, subjected to relevant regulations.

Recycling and Waste

■ Goals

The percentage of total materials recycled on campus will be significantly increased, with the following goals:

• **2015 – 2025** - A 50% reduction in the quantity of mixed waste removed for landfill (meeting the national target set by the Ministry of Environmental Protection subject to dedicated budget).

• **2025 – 2045** - Reduction in mixed waste for landfill in accordance to new national targets that will be set by the Ministry of Environmental Protection.

• All waste generated in the Technion will undergo recycling at approved facilities.

During demolition or construction of buildings or the refurbishment of existing buildings:

a. Solutions for re-use of earth materials will be explored.

b. Building permits that include the demolition of existing structures to a level of more than 1,000 cubic meters of building waste will be required to include solutions for re-use of the waste.

Green Building

Green construction is construction that minimizes damage to the environment, while also creating improved conditions of comfort within the building for its users. This is done through minimizing the use of non-renewable resources (such as energy, water, land, and materials), and by using design and construction techniques to provide high quality of air, light, and acoustics within the building, as well as using materials that do not contaminate the

environment. A green construction standard, such as LEED2 or BREEAM3 is used in the design and construction stages, and throughout the life of the building.

■ Goals

New buildings and buildings undergoing renovation will be planned as green buildings, and will meet the standard such as the Israeli standard 5281, according to the following requirements:

• **2015 – 2025**: By 2025 all new buildings will be planned according to the requirements of ISO 5281, to a level of at least one star. At least one building will be planned to a three-star level.
• **By 2035** all new buildings will be planned as green buildings to a level of at least three stars.
• **From 2035** all new buildings will be planned according to standards adopted by leading peer academic institution worldwide.

■ Main recommendations

a. Tenders for design and construction of new buildings, and for renovations to existing buildings on campus will include the requirement to meet the green construction standard, in accordance with the goals listed above.
b. In parallel, a plan will be drawn up for the improvement of climate control systems, water conservation, and energy efficiency in existing buildings that are not set to undergo renovations. This plan may be integrated with the plan to reinforce and protect existing buildings (see previous section).

Landscaping

The strategic plan aims to ensure green construction in the open public spaces of the campus, according to internationally accepted standards.

■ Goals

• Adoption of two American standards for green construction in open spaces: one for green infrastructure (the Envision standard), and the second for site planning and landscaping (the Site standard).
• Gradual adoption of the standards over a period of years, leading to their full implementation by 2025 (similar to the adoption of the standard for green building construction).

Green Roof Amado bldg. (illustration)
Amit Teiman, Zvika Kanonich, Lucy Brickman, Hadas Ophrat

■ Flora, Gardening, and Irrigation

The flora of the campus will mix wild and domesticated species, and will represent all types of vegetation: trees, shrubs, perennial grasses, geophytes, climbers, succulents, and annuals. The flora will meet both design and practical needs, such as: preventing soil erosion; purifying water and acting as a biological filter; providing refuge and nesting places, as well as food for birds and animals; creating a microclimate; and emphasizing seasonal changes.

Making use of existing resources – water, land, and vegetation – is key to maintaining a stable, sustainable environment over time, while increasing the variety and wealth of flora and fauna that give the campus its identity, within and without.

In choosing vegetation for the campus, consideration should be given to the effects of surface runoff water, and of the quality of local soil.

■ Goals

• Strengthening, protecting, and increasing the density of the forest and of the botanical resources throughout the campus
• Creating a planted forest in areas zoned for construction and development
• Emphasis on local species
• Routine professional management of the campus trees
• Continuous maintenance of the Technion's tree inventory
• Locating special specimens, conserving them, and transforming their locations into shady gathering places
• Ensuring maximal growth conditions for trees in construction and development zones
• Nurturing the biological variety throughout the campus, including in the developed areas
• Use of natural fertilizers and pesticides only

Environmental Education

The Technion will be a leading institution and will aspire for excellence in active environmental education and in social responsibility.

■ Goals

Instilling knowledge and awareness of environmental sustainability among all those on campus – students, faculty, and employees – by means of academic courses, open courses,

and sustainable activity on campus on a day-to-day basis.

Main recommendations

a. Opening tracks for training leaders who will be sustainability-aware and environment-sensitive.

b. Employee training and courses on issues of environment, sustainability, and energy efficiency.

c. Increasing the number of courses relating to environmental issues, both academic and non-academic, including production of a catalogue of environmentally-related courses for the convenience of campus students interested in these issues, and to publicizing the courses to as wide an audience as possible.

d. Introducing content relevant to the campus as course projects, and as part of the programs of study, to create an interface and feedback mechanism between students and faculty on the one hand, and the everyday running of the campus on the other.

e. Engaging everyone on campus in action for the good of the environment, the community, and public health, via integrated projects between the various populations (students, Green Campus, student union, dean's office etc.), and the establishment of a joint administration to promote such projects.

f. Nurturing local culture, landscapes, and heritage as social and environmental resources – making the Technion's heritage, historical displays, and the history of the campus more broadly accessible. Helping newcomers gain familiarity with the local landscape and varieties as part of their introduction to the campus. Integrating these subjects as part of the orientation process for new students and employees, in order to increase the sense of belonging, and of organizational pride and loyalty.

g. Promoting access to environmental knowledge and information via the Technion website, together with the Green Campus website, and other relevant sites associated with the Technion.
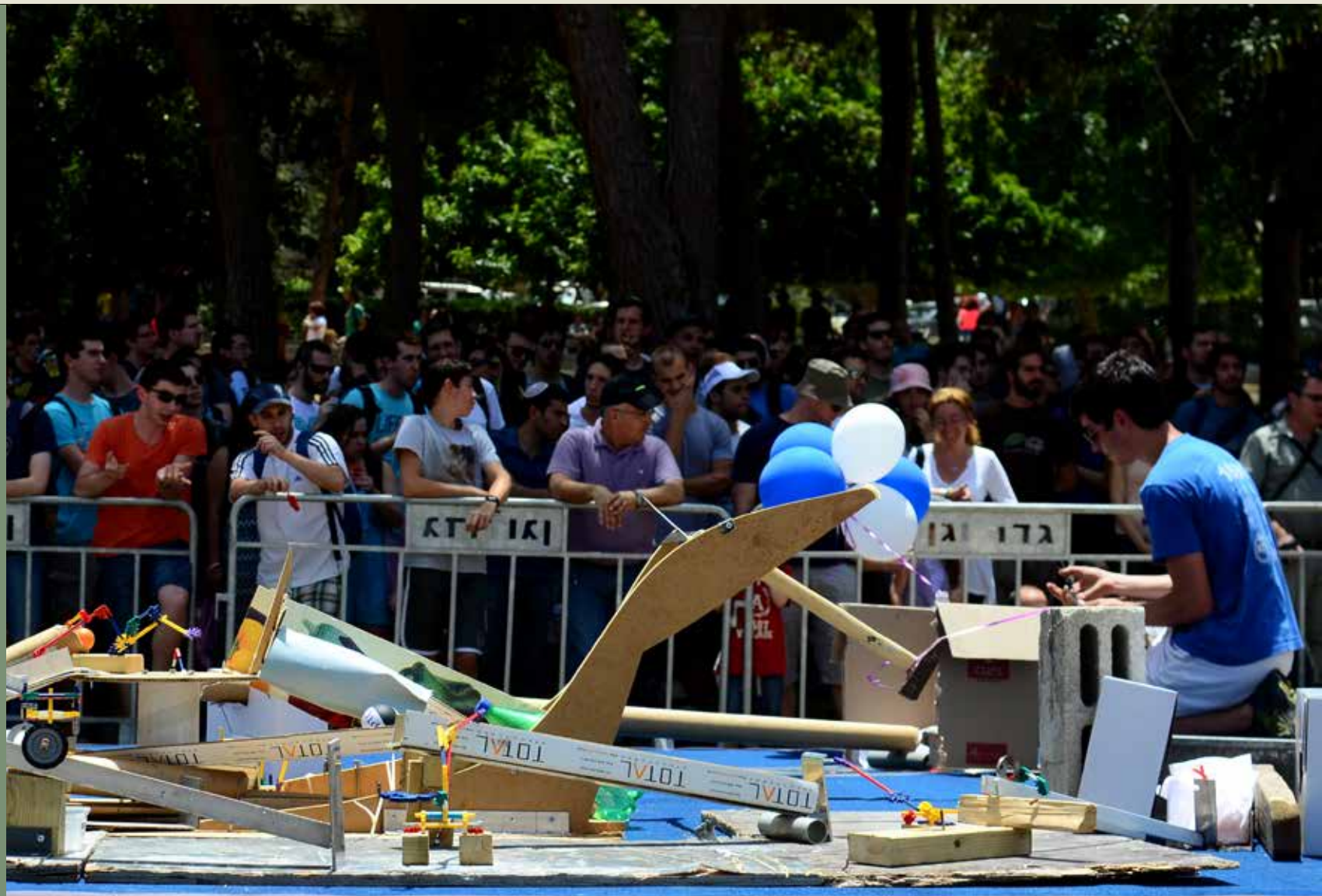
Chapter 11: **Safety**

Safety

The Technion's vision on matters of safety, health, and environmental quality is to provide a safe and healthy environment for the entire campus community, while instilling a culture of health and safety among its managers, workers, researchers, students, and visitors, including contracted workers, with the aim of preventing injuries, work accidents, and occupational disease

■ Main safety challenges

- Dangers associated with innovative research, sometimes involving the use of large quantities of dangerous substances (chemical and biological agents), radiation of various kinds, and different technologies, alongside wide scale public activity throughout the campus.
- Dangers of old and historic buildings which do not meet modern safety demands and standards (fire safety, emergency exits, laboratory and hazardous materials standards, ventilation, etc.). In some buildings there is extensive use of asbestos.
- Lack of separation between vehicular traffic, cyclists, and pedestrians.
- Possible health problems as a result of air pollution, due the large number of vehicles and buses passing and standing close to buildings and concentrations of people.

■ Goals

- Prevention of accidents and occupational diseases throughout the campus
- Protecting the quality of life of all employees, students, and visitors in the Technion campus
- Promoting a culture of safety among all groups within the campus
- Making the Technion a leading institution on safety and health, in Israel and worldwide
- Prevention and minimization of hazards and faults that might cause damage to people or property
- The system of laws, regulations, and standards, alongside Technion policies and instructions concerning health, safety, and environmental quality, will form the basis for protecting all Technion employees, students, guests, and visitors, on the campus and wherever Technion

activities are held, including anyone carrying out work on behalf of and for the Technion, and residents or tenants in Technion properties.

- Main recommendations

a. The Technion will work to meet the Israeli standard 18001 (ISO) for the campus (management of safety and health systems) by 2020.
b. During any renovation, conservation, or improvement work on existing buildings, the Technion will work to upgrade the buildings and their surroundings to meet contemporary safety standards according to legal requirements, and wherever possible to a higher standard.
c. Asbestos removal – Asbestos structures and elements should be removed with the highest priority from buildings that serve as residences, from hazardous laboratories, and from densely populated buildings.
d. The Technion will set up a modern waste removal site that meets safety standards with a view to the future expansion of campus activity, and the protection of safety and health.

- Hazardous Materials

Within the Technion campus there are 3,000 hazardous materials of different kinds that require a toxic substance permit. The permit granted to the Technion is for 200 groups of toxins, and is maintained on a regular basis with the Ministry of Environmental Protection in accordance with its demands. A hazard review of the Technion was conducted and authorized by the ministry.

Most of the faculties whose work involves the use of hazardous materials were concentrated at the north eastern corner of the campus (chemistry, biology, chemical engineering, microelectronics, biotechnology and food science, the chemical warehouse, chemical waste removal, etc.). Over the years, the distribution of the buildings has changed, so that there is now a mixture of buildings with concentrations of hazardous materials close to buildings with other public uses. Beyond the safety risks of those who actually handle these materials, this situation poses an unnecessary risk to the broader public. One such example is the warehouse for removal and treatment of chemical waste, now located at the heart of the Gutwirth Ecological Garden.

- Goals

Areas that contain hazardous material use will be separated from public areas that serve large number of people to ensure the safety and health of the campus public.

■ Main recommendations

a. Zoning should be conducted, and separate areas maintained for laboratories and the use of hazardous materials.

b. Areas in which the handling of hazardous materials will be concentrated will be such that allow the safe, comfortable, and effective management of these materials, in routine and emergency situations alike.

c. Any additions of a laboratory or activity that involves hazardous materials will locate these, as far as possible, within the areas designated as zones for concentrations of hazardous materials.

d. Activities that don't involve the use of hazardous materials, and that are currently located within areas of concentrations of hazardous materials, should be moved elsewhere on campus.

e. An alternative site should be found for the warehouse for the treatment of chemical waste.

....

Earthquake Resilience and Shelters

Resilience is a central part of sustainability. Ca 50% of the built-up area on the campus was constructed before 1980, and it can be assumed that most of it does not meet standards for earthquake resilience, or meet the necessary requirements for protection from hostile acts. Buildings which are not sufficiently sound, and those lacking protection, need to be reinforced. Earthquake resiliency standards are applicable both to new buildings and, with some concessions, to existing buildings.

The guidelines for building protection are laid down in civil defence regulations. The claim that during times of crisis the campus is largely or completely empty, may not be valid in reality. First, the Technion may be assigned roles during an emergency that require the full functioning of various systems or people. Secondly, as a large public area set within the conurbation of Haifa and Nesher, and with reasonable access, the campus may serve as a 'safe haven' for populations and for activities that require protection during times of emergency. The provision of emergency safe spaces is one of the campus's public roles, and part of its sustainability approach.

■ Goals

It is proposed that the planning be split into three milestones:

• By 2025, at least additional 10% of the not reinforced buildings on campus should meet

earthquake standards, and will meet guidelines for protecting their populations and essential and vital equipment.

- By 2035, at least additional 25% of the not reinforced buildings on campus should meet earthquake standards, and will meet guidelines for protecting their populations and essential and vital equipment.
- By 2045, according to standards for public buildings

■ Main recommendations

The existing policy should be implemented, according to which any significant addition, change, or renovation carried out to existing buildings should also require performing the necessary work to reinforce it for earthquakes, and to add suitable protection elements.

In parallel, a plan should be drawn up for the reinforcement and protection of existing buildings, which will set out timetables for the work, and describe the means for conducting it.

Chapter 12: **Infrastructure** _(to be completed)

General

A comprehensive infrastructure plan will be prepared for the Technion campus. The plan will include the layout of all the infrastructure systems on campus, including electricity and energy infrastructure, natural gas, communications, water, sewage, and drainage, and a detailed run-off water appendix. This plan will be updated periodically in line with the development and planning stages.

■ Recommendations

a. Submersion of infrastructure lines – all new infrastructure lines in the campus should be subterranean.

b. Existing lines should be gradually re-laid underground according to a staged plan that will be drafted.

c. Integration of infrastructure facilities – wherever possible, infrastructure facilities will be integrated into the underground parts of buildings or as part of land development works. Infrastructure facilities located in strict and moderate preservation areas will be planned in accord with the preservation guidelines.

d. All infrastructure facilities will be planned with the participation of a landscape architect.

e. The construction of infrastructure tunnels to unify infrastructures will be considered.

f. Contracting with private electricity producer for clean energy use will be considered.

g. The following sections deal with infrastructure throughout the campus. These do not refer to the infrastructure or to electrical installations within the buildings.

Electricity

■ Recommendations

a. **Power stations**: The establishment of new conventional power stations to provide electricity will not be permitted within the area of the plan, with the exception of: emergency generators, and systems for the production of electricity from renewable sources.

b. **400 kV conductor systems**: Conductor lines or 400 kV stations will not be allowed within the campus.

c. **161 kV conductor systems – substations**: A new substation will be built, as per a draft plan that will be prepared and authorized by the Technion, in consultation with the Technion's engineering units. The new station will upgrade the campus electricity network and increase its reliability, as well as reduce the Technion's electricity rates. The substation will be planned as a closed station, and will be made suitable for the use of high voltage equipment. For purposes of conserving space and of safety, the station will be erected as close as possible to adjacent infrastructures and facilities, with minimum impact on the surrounding area.

d. **161 kV transmission lines**: The development of new transmission lines will be allowed only with the use of underground cables.

e. **Distribution system – high voltage and low voltage distribution lines**: The development of high voltage and low voltage distribution systems will only be allowed using an underground network, with the exception of maintenance work or localized changes to existing lines, or repairing faults. High voltage networks will be planned and adapted to the existing ring main distribution systems on campus, wherever possible.

f. **Distance of infrastructure installations from buildings**: In places where infrastructure is installed above ground, greater distances from buildings will be maintained than those specified in the Electricity Law. These distances will meet the standards of the Israel Electric Corporation and of every other recognized authority in Israel.

g. **Distribution system – transformer stations**: The development of transformer capability with transformer stations will be planned using interior transformer stations. The installation of new, overhead transformer stations on electricity pylons will not be allowed, with the exception of emergencies and of repairing faults. The erection of transformer stations will be permitted in all of the designated development areas, and for any use allowed by the overall building rights that are applicable in the respective planning zone.

h. **Distribution system**: Electrical distribution and safety boxes ("feelers") will only be installed where no solution within a building is possible, such as electricity panels for event areas. Access to distribution boxes will be kept away from the sidewalk, or will be protected with a concrete surround.

i. **Use of renewable sources**: The Technion will give priority to the use of renewable energy sources, both in terms of lifecycle cost and as an experimental laboratory for the use of renewable energy in higher education institutions and in urban settings in general. It is proposed that the Technion set

itself the goal of being a leader in the use of renewable energy sources as part of its overall vision, of its sustainability goals, of the Green Campus activities and of the activities of the sustainability office that will be established.

j. All new construction and significant additions will be examined for the potential integration of renewable energy sources, such as the installation of photo-voltaic panels on balconies, roofs, etc.

k. **Electric transportation**: The possibility will be explored of running a shuttle service using electric vehicles. Prioritization will be given to electric vehicles on campus.

Chapter 13: **Implementation Guidelines**

Chapter 1 of the strategic plan includes the vision, objectives and program that are intended to guide the development, maintenance and management of the TechCity21 area in the coming decades. The time span for the plan was set at 30 years, but the recommendations are to be applied as soon as possible.

Integration with the Operating Procedures of the Technion's departments

■ Recommendations

a. It is recommended that the vision, objectives, program and principles detailed throughout the program, which comprise the essentials of the plan, are used as general guidelines by the Technion's departments and management when initiating or approving development and maintenance actions.

b. The detailed recommendations of the strategic plan will be integrated in the work plans and ongoing work of the Technion's departments, particularly the Construction and Maintenance Division.

c. The Technion management will define the responsibilities and timetable for implementing the recommendations of the strategic plan, and the manner in which the work plans, budget structure are executed. They will incorporate the goals, program, principles and performance standards recommended by this plan. For example, it is recommended that proposals regarding the work plan, budget and execution will be accompanied by a comprehensive explanation of the level of contribution to or deviation from the objectives, principles, program, and recommendations of the strategic plan. When necessary, a checklist will be prepared in order to aid in the preparation and in supervision of the implementation of this plan.

d. The strategic plan will serve as leverage and a framework for fundraising and as a guide for prioritizing allocation of that funding. It is recommended that various components of the plan be developed into donor portfolios and offered to funders.

Plan Implementation Estimated Investment

The plan recommends the accelerated and sustainable development of TechCity21, including the enhancement of public space and the upgrading of its infrastructure and resilience levels.

Campus development nearly doubles the built space on campus, gradually over a 30-year period, up until 2045.

The additional construction is approximately 500,000 sqm. of which 200,000 sqm. will be dormitories and the remainder will be used for academic purposes, including teaching, research, innovation, and auxiliary social, recreational and sports facilities. It should be noted that part of the additional construction refers to in-depth conversion and adaptation of existing valuable buildings which are underutilized. These retrofit efforts should be of the highest priority.

The average cost per square meter for constructing dormitories (including systems and furnishing) is estimated to be NIS 9000, and for academic buildings (Not including systems and furnishing) NIS 12,000. Therefore, the estimated cost of the new construction alone is NIS 5.1 billion when spread over 30 years. Gradually, moderately at the first decade and accelerated later:

- Until 2025 – Additional 100,000 sqm (20%)
- 2025 – 2035 – Additional 173,000 sqm (34%)
- 2035 – 2045 – Additional 235,000 sqm (46%).

New projects costs evaluation will take into account projected ongoing maintenance cost (Life Cycle Costs)

Construction costs per sqm. According to use

	Overall construction	Average annual construction	Cost per sqm. (NIS thousand)	Annual average (NIS thousand)
Academy	169,700	5,657	12,000	67,884
Dormitories	188,00	6,267	9,000	56,403
Welfare	40,400	1,347	9,000	12,123
Innovation	45,000	1,500	9,000	13,350
Reserve	62,000	2,067	10,000	20,670
Total	506,000	-	5,126 million NIS (distributed until 2045)	

This development pace is directed to enable adaptation and renovation of the existing buildings first.

Added to the annual cost detailed above are elements of ongoing maintenance, adaptations to existing structures and spaces, and adaptation to new and changing standards such as earthquake reinforcements, protection, safety and accessibility.

Plan Implementation Estimated Costs

Average Yearly Cost (Million NIS)			
Costs	2015-2025	2025-2035	2035-2045
New Building	108	184	248
Maintenance and upgrade*	50	60	70
Infrastructure and Landscaping	10	17	24
Organizational Running Cost	3	3	3
TOTAL	171	254	325

* Including applying new measures and standards of sustainability, health, safety, accessibility and earthquake and civil defense regulations

Total Estimated plan casts: 5.1 Billion NIS

Organizational changes

In order to implement the strategic plan, certain organizational changes are recommended:

a. A planning manager will be nominated to monitor the plan's progress and will initiate its periodical update.

b. An expert consultant will be assigned to develop a multi annual plan that examines the needs for study space and advanced teaching aids.

c. A comprehensive study will be performed concerning the cultural, sports and catering needs for the next decade to accord with the campus population growth and its projected spatial distribution.

d. A point person, public space caretaker, will be assigned.

e. A project management team will be appointed to implement the BIM system, integrating it into
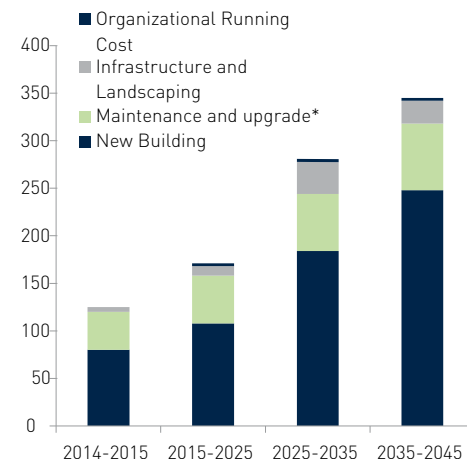
the Construction and Maintenance Division. Life Cycle Cost estimates will be incorporated into the project's evaluation processes, among others.

f. A sustainability office will be established, as described in chapter 10.

g. A transportation control officer will be assigned to manage the smart parking system and the shuttle busses.

h. It is recommended that the steering committees that were formed to create the plan will continue to accompany the implementation of the plan and its monitoring and update.

i. The plan implementation will also be followed by the Technion's management.

j. The possibility of continuing the academic involvement of the Faculty of Architecture and Town Planning, the Faculty of Civil and Environmental Engineering as well as other academic units in the implementation and monitoring process will be examined.

Development and Update of the 3D Model

As described above, a parametric 3D digital model of TechCity21, including all existing development has been prepared as part of this plan. This model is intended to be used as a dynamic design and decision making participatory tool that spatially examines any significant development in the campus and around it.

Open Space Design and Management Using BIM

BIM (Building Information Modeling) is a method of work implemented for the design, engineering, management, construction, and operation of buildings, based on computerized technology for 3D parametric modeling of all the information regarding a construction project. The BIM model enables the running of various simulation functions on the existing model throughout the building's design, erection and operation.

■ Recommendation

BIM systems (or similar technology) will be implemented within the Construction and Maintenance Division.

Chapter 14: **Follow-up, Evaluation, and Update**

A Structured Post Occupancy Evaluation Process (POE)

The most efficient way to ensure the quality of buildings, infrastructure and landscapes is to apply an ongoing mechanism of monitoring, evaluation and updating. The widely-used "Post Occupancy Evaluation" (POE) process is aimed at examining the project's concurrence with its pre-determined goals, and the satisfaction level of the users and stakeholders. The process allows the relevant parties to:

- Identify successes and shortcomings in the decision making process and drawing lessons for future projects.
- Constantly improve the performance of the examined project.
- Get reliable feedback and use it to improve future projects.
    - The purpose is to assist the Technion to become a 'learning institution,' which draws conclusions and creates 'circles of constant improvement.'
    - The process of monitoring, evaluating and updating will also develop the active participation of campus users and the general public in the ways space will be used and adapted.

The process also encourages monitoring and control of the environmental performance of the evaluated project, thus allowing constant adjustment and response

Monitoring the Implementation of TechCity21 Vision and Goals

a. The Technion management will set annual objectives in the implementation of this program's goals.

b. The Construction and Maintenance Division and other relevant units will present an annual report regarding the implementation of the plan's goals and the annual objectives.

c. The new sustainability office will present an annual report regarding the implementation of the environmental goals of the plan.

d. The reports will be presented on the Technion website.

Once every five years, the Technion management will examine the plan, and initiate changes where needed. The plan will be thoroughly updated every decade.

Conclusion

The hybrid ForestCity combining both the relaxing, and informal 'forest' image and the well connected, well served, rich and vibrant 'city' image, directly serves all 10 goals of the plan. Attractive, affordable, well maintained and well serviced housing, rich choice of formal and informal learning spaces, state of the art research environments, and new innovation centers all serve to nourish the Technion's human capital, foster innovation, facilitate international cooperation and build a vibrant and intellectually dynamic home.

The green campus policies and organization, the pedestrian friendly, more walkable landscaping and connectivity, new integrated car sharing transit and parking policies, joint cultural and educational programs with the neighboring cities and renewed safety and infrastructure policies make the campus environmentally sustainable safe, healthy and more resilient and better integrated.

The special structure that differentiates between development and preservation oriented zones, the care for the architectural heritage and many beautiful, memorable spots around the campus and urban design guidelines of scale, footprint, and public space enhancement foster spatial quality.

While rigorously quality oriented, the guidelines of this plan are still highly flexible – they can give way to adapt to change and uncertainty.

All this is dynamic and well monitored to always improve and operate as academia should, as a living laboratory of reflection, creativity commitment and responsibility.

The TechCity21 process in a unique opportunity to lead the Technion's campus in a fast changing world to promote excellence and innovation and best support the Technion's vision" to be among the world's top ten science and technology research universities".

Appendix

Development districts

Moderate development

Ecological historic corridor

Sports center

Canada Dormitories

Northen district

Western district

Life Science

Campus center

Undergraduate Dormitories

Affiliates

Promenade East

Eastern district

Southern district

Upper Hill

Landscape preservation ranking

Strict Landscape
Preservation

Moderate Landscape
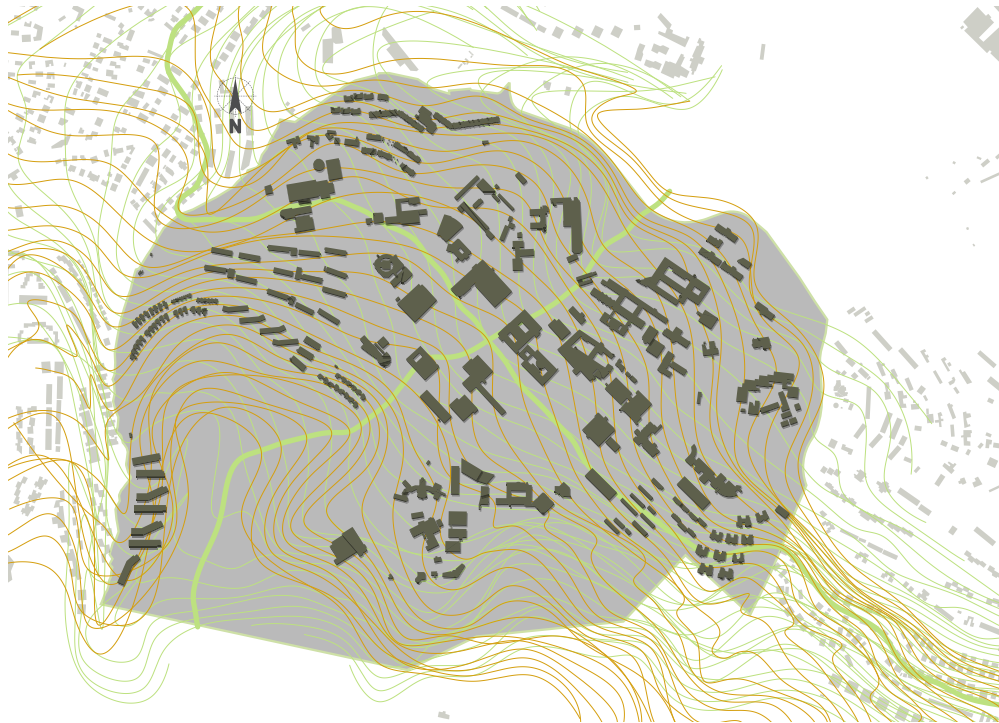Preservation

Landscape
Preservation

Campus
Center

Vehicles

Public Transport

Pedestrians

Bycicles

Cable cars

מקרא

מבנים ומוסדות ציבור

עיצוב מיוחד

הנחיות מיוחדות

כניסה למתחם