

## Chapter VIII: Higher Education and Scientific Research

### Introduction

The higher education system has undergone many changes since the establishment of the state. Initially comprising two universities (Hebrew University and the Technion) and a research institute (the Weizmann Institute of Science), Israel's higher education system now consists of 65 institutions<sup>18</sup>, among which there are seven universities, including the Weizmann Institute, and a variety of colleges. About one quarter of a million students are currently enrolled in the system.

The missions and objectives for the coming years present the system with additional considerable challenges, whose attainability is in doubt, unless structural changes are made, objectives are set and appropriate resources to achieve them are allocated. The higher education system is one of the most important national infrastructures for advancing Israel's society, state, economy, welfare, security and national values. Achieving this plan's strategic high economic growth objective of over 6% a year will depend upon training an educated labor force, which is the product of a dynamic, quality oriented higher education system. It follows that nurturing diverse, accessible and high-quality higher education is one of Israel's most important objectives for the coming two decades.

### Vision and Strategy

Achieving the primary objectives of advancing the nation, its values, its economy and its welfare, all of which constitute the foundation of Israel's quality advantage and rely upon its spiritual, cultural, scientific and technological strength, must follow Israel's higher education road map, to be outlined according to the following vision:

**Promoting a higher education system that ensures research excellence at the standard of the world's finest universities; offers universal access; provides fair and equal opportunity for all; and enables the individual to fulfill his or her potential. This system will be composed of a number of tiers and comprise a variety of institutions that enjoy broad administrative and academic freedom. The system will be open and amenable to students' transition between tiers, and will charge a fair tuition, while providing accessible financial aid tools for those in need.**

Basic research conducted at research universities is the central pillar of Israel's science policy, and an important basis for its economic and social development. It follows that **conducting**

<sup>18</sup> These include seven universities, an open university, four designated colleges, five engineering colleges, 13 general colleges, nine private colleges, 26 teachers' colleges.

**scientific and technological research of the highest standard is necessary in order to maintain and advance Israel's scientific standing and to ensure its economic and security future.** At the same time, Israel must maintain and promote strong involvement with world science and with international scientific organizations and institutions. **In addition, ensuring high standards in the humanities and social sciences is an essential national need. Finally, another major task of universities, of equal national importance, is training the best and most talented young people in all disciplines at the B.A. level.** When the time comes, these graduates will comprise Israel's leadership echelon in all spheres of life. Like the rest of the developed world, Israeli society is willing to bear the university system's expenses, in view primarily of the latter task, while also recognizing the importance of the former.

**According to the road map proposed here, a quality, world-class higher education system will be created gradually over the next twenty years, to include at least two research universities whose academic achievements place them among the world's twenty leading institutions. Also, according to the proposed road map, by 2028 over 75% of the relevant age group will acquire higher education. The system will encompass a wide variety of academic institutions: elite universities, universities that confer all degrees, an open university, academic colleges and community colleges, all of which will operate side by side, nurture competition, aspire for excellence, and complement each other in various realms.**

## Situation Report

Israel's higher education system has experienced rapid growth for some time. Historically, it has transitioned from a system characterized by elitist access (in the 1950s and 1960s), through broad access (the 1990s), to the universal access of the twenty-first century and beyond. During this period, the number of students has increased from a few thousand in the 1950s to 250,000 in 2007.

The system's structure and management are regulated by the 1958 Higher Education Law, which stipulated the establishment of the Council for Higher Education (CHE). In 1977, the Planning and Budgeting Committee (PBC) was created by a government decision. The CHE regulates institutions' licensing and the awarding of degrees, while the PBC regulates the system's planning and budgeting by the government. The PBC conducts negotiations with the Finance Ministry regarding the entirety of the system's resources and their distribution. The current model for university resource allocation is based on a formula for a teaching budget for bachelors programs, determined by the number of students (subject to PBC rules) and type of discipline; and an institutional research budget determined by research output (according to the number of advanced-degree students, publications and citations, research funds raised by the university,

and other similar criteria). On average (with the exception of the Weizmann Institute, which is a research institute without a bachelors program), about two-thirds of a university's budget is based on teaching, and one-third on research output. College budgets are for teaching only.

The present post-secondary system, which developed partly out of organized planning and partly out of domestic and foreign private initiatives, is comprised of about 120 post-secondary institutions. These include universities, academic colleges, colleges for technicians and practical engineers, non-academic teachers' seminars, art schools and vocational training schools.

## Dilemmas and Problems

The existing system, its structure, its management and its budgeting, which served the state well for decades and saw considerable achievements, no longer fits our future needs, for the reasons detailed below.

### 1. National Higher Education Policy

Currently, there is no policy defining the optimal size, scope and composition of the higher education system from a national perspective for the coming twenty years. Such a policy is essential for any long-term planning for the Israeli economy. A long-term perspective is especially important for the planning and developing of the higher education system, where the time constant from planning to academic output is about ten years; and if one considers the school system through matriculation, this period increases to thirty years. In light of the trends in Israel and around the world, it is clear that the system needs to grow significantly.

### 2. System Funding and the "Brain Drain"

There is no long-term national policy for setting the higher education budget, which is an integral part of long-term planning. Although PBC does operate according to five-year plans agreed-upon with the Finance Ministry and approved by the government, this has not prevented the budget cuts that have been made in recent years. Since the beginning of the 21<sup>st</sup> century, these cuts have posed a difficult challenge for Israel's university system and scientific research, causing a slump, even a standstill. Universities suffer from lack of resources for advanced research; a diminishing, aging academic faculty; and, as will be described below, an inability to bring the best young scientists back to Israel and to prevent a "brain drain". While Israeli science and its system's graduates remain of high quality, they are the product of 75 years of effort and past progressive national policies; absorption of world-class scientists; nurturing of domestic talent; and dedication and Zionism of academic faculty, for whom returning to Israel after advanced study abroad was a given, and who saw academic work as a national mission, not a personal career. The current trend, however, indicates a decline in quality. Should the system deteriorate, in the absence of all these

irreplaceable historical components, all of this will be lost, and it will be impossible to restore the required standard and quality.

### 3. Regulatory Bodies

The system's present size already renders CHE's and PBC's centralized and intensive management of each institution inefficient to impossible. Each new program of studies or degree at any of the system's sixty academic institutions (universities and colleges), requires budgetary treatment by PBC as well as approval by CHE, via ad-hoc committees. Any of PBC's allocations to these institutions undergoes laborious negotiations between the institution and PBC; each of the institution's budgets requires PBC approval.

### 4. Components of the System: Universities and Colleges

Due to the current world view of the higher education system, and CHE and PBC policy, all seven universities see themselves as elite research universities, and many colleges aspire to attain university status. This policy necessarily produces equal distribution of institutional research funds, which does not encourage nurturing centers of excellence. Israel cannot provide adequate resources to maintain seven research universities at the highest world-class standard; no less important is the fact that the human resource of leading world-class scientists and prominent humanities and social science scholars is not available to achieve this objective at all seven universities in most disciplines.

Significantly increasing Israel's research budgets as proposed in this plan, will allow focal points of excellence at some universities to promote and nurture research at the highest international level. In our estimation, increasing research funds to the proposed extent will enable at least two universities to reach elite university status.

Public colleges were designated to be learning and teaching communities that fulfill an important role in training a high-level professional labor force. Some colleges' aspiration to become universities impairs the fulfillment of the designated mission envisioned for them when the college system was created. Furthermore, a system that lacks community colleges and two-year professional institutions which are formally connected to the higher education system in a regulated manner, cannot provide universal access to higher (post-secondary) studies while fulfilling, at the same time, the state's human resource needs. Universal access, which we have set as a national objective, means that at least 75% of the relevant age group will be engaged in post-secondary studies.

### 5. Research and Excellence

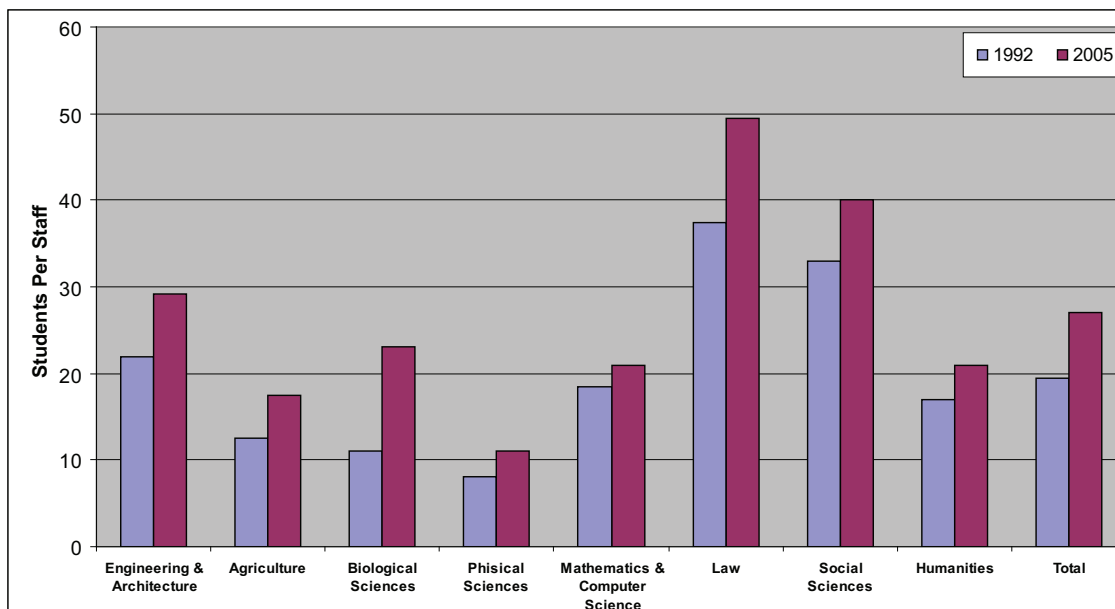
Promoting human knowledge through research in broad scientific and technological fields is a major role of universities, where most of Israel's basic research is conducted. In the past, this cornerstone of Israel's national science policy stemmed from the recognition that in a small country, the university system alone would preserve scientific quality, through a critical

mass of researchers and research infrastructure. As a result of this policy, Israel's basic research has achieved an international level, and in a number of fields at universities, has arrived at the forefront of world research. Basic research constitutes a tier of technological objective-driven research that relies on involvement and funding by the business sector, the government and the institutions themselves. The country's socio-economic and security-related achievements are the product of past investment in human capital and research infrastructure. Action needs to be taken to maintain and promote the high level of scientific and technological excellence, by building appropriate human and research infrastructure and ensuring the stability of its operation in the framework of a multi-year budget.

## 6. Preserving, Developing and Enhancing Academic Faculty

In recent years, the number of academic faculty members has continually declined, relative to the massive increase in the number of students, a trend that has significantly eroded the student-faculty ratio (Chart A). This trend has serious implications for the development of the higher education system. There is a need to recruit young, high-quality faculty for research institutions, in order to achieve a number of faculty members that better corresponds with the increase in the number of students, and to replace faculty members who retire each year.

**Chart A: Student: Staff Ratio for 1991/2 and 2004/5 (Source: PBC)**



A relevant issue of national importance, which demands appropriate policy, is that of the "brain drain": scientists who accept offers to move to outstanding research institutions abroad, particularly in the US.

Another phenomenon that has exacerbated the system's problem in recent years is that of excellent academic personnel who do not return to Israel after receiving their PhDs or following their post-doctorates abroad, particularly in high-demand fields in the US and some of the EU countries. A state intervention program is required to help provide Israel's research institutions with the needed resources and research infrastructure to bring quality faculty back to Israel. Due to insufficient hiring of academic faculty members, the ratio of teachers to students has declined in all faculties, which may cause a decline in teaching quality, not only in research.

### **7. The Impact of Colleges on the Direction and Quality of Higher Education**

Many colleges, especially in the periphery, are unable to recruit a critical mass of senior academic faculty whose primary work is at the college. In addition, most of the colleges have a small student body. Twenty-one colleges with an average of less than 2000 students are budgeted by PBC. Colleges that train teaching staff have low enrollment, and on average, the 27 existing colleges of the various streams, have about 1000 students per college. These figures require rethinking the structure and distribution of the academic college system, so that they may be efficiently operated both academically and administratively.

### **8. Private Colleges and Foreign Extensions**

No clear national policy exists regarding the status and role of private colleges and foreign extensions in the system. On the one hand, non-budgeted colleges and foreign extensions regulate high demands for popular disciplines, especially business and law, and on the other, alter the map of public higher education and charge high tuitions. Considering that the degrees they confer are recognized, there is a lack of thorough, organized quality assurance in this regard.

### **9. Tuition**

Traditionally, tuition has been set by a public committee, with representatives of the institutions, students and the Ministry of Finance. Experience shows that such committees are subject to political pressure, individual interests and populism, and are, therefore, no longer productive. A new model must be found for setting tuition.

### **10. The Ultra-Orthodox Sector**

In the Israeli reality being formed in recent years, a phenomenon is emerging that will pose an important challenge for higher education's objectives. The ultra-Orthodox sector, which places the study of Torah and yeshiva study at the center of life ("the learner's society"), does not participate in academic study at higher education institutions. Not only does it have a low participation rate in the labor force, but its participation in higher education is also very low. The sector's skills, therefore, are insufficient for the advanced, developing labor market.

Subsequently, those from the sector who do enter the labor market have a low income level. It is a unique challenge, then, to adapt the required conditions for this sector, in order to facilitate its participation in the acquisition of higher education in a way that fits its lifestyle, while ensuring essential core studies in its elementary and secondary school systems.

## 11. The Arab Sector

In recent years, there has been an increase in the Arab participation in post-secondary professional education and teachers' colleges; however, this sector's relative share in the higher education system remains low. We must find ways to enhance the Arab sector's access to higher education across institutions and disciplines.

## 12. Quality of High School Education

Graduates of the formal education system are the foundation and the human infrastructure of the academic training in the country, and from them Israel's future scientists.

Recent decades have seen a decline in high school education and preparation for entrance to University. Eligibility for matriculation is also at a standstill and not increasing. Breaking this standstill will require increasing the matriculation eligibility rate in the periphery, the Arab sector and the ultra-Orthodox sector. Unless changes occur in the ultra-Orthodox sector, in which the number of Torah learners is increasing significantly, the change will be slow and insufficient.

## 13. Training for a Labor Force According to Current and Projected Needs

In addition to the usual tasks of the higher education system, it is sometimes required to provide an appropriate response to manpower shortages that develop in certain fields. This happened in the 1990s, when a manpower shortage was created in the fields of computer science and electronic engineering. If this strategic plan is not adopted, we can expect a severe shortage in a professional labor force for building physical infrastructures and in training high-level public administration manpower.

Israel lags behind considerably in most of its physical infrastructures, relative to all other Western countries. Development of physical infrastructures such as transportation, seaports, airports and mass transit systems, requires significant manpower training in the field of civil engineering and other complementary fields. This development also requires preparing the higher education system for this challenge (for more on physical infrastructures, see Chapter XI).

Improving Israel's public administration is a prerequisite for economic growth and building a modern, value-based society. Improving manpower inputs in public administration (such as in the areas of health care systems management, local government management, or non-profit organization management), must be done through the higher education's manpower training system.



## 14. Institutions' Internal Governance

The governance of universities and colleges (excluding the Technion and Weizmann Institute) was founded on the unique Hebrew University model, featuring a dual structure of President and Rector. This structure was changed a number of years ago by PBC and CHE, inspired by the Finance Ministry (according to the report of the Maltz Commission, "Changes in the Organizational Structure of Universities in Israel"), to a unitary model, in which the institution is headed exclusively by its President. However, apart from this commendable change, other components of the changes evoked controversy and debate: they create the potential for conflict with academic freedom in regards to governance and internal management; neutralize any real authority of the Board of Trustees (although most important donors to institutions are board members); and grant excessive power to the Executive Committee, thereby decreasing academic faculty's involvement in the institution's management. Additional follow-up will be needed in order to examine the nature of advisable governance for each academic institution.

## 15. Administrative Authority and Responsibility

At present, all of the responsibility for managing the institutions is placed (justifiably) on its Presidents. However, they lack the powers required for efficiently managing the institution. For example, university management lacks the basic authority to set the academic faculty's wage terms; promote new academic programs without the regulatory bodies' approval; build new buildings; and set the tuition rate.

## 16. The Role of Philanthropy

In most countries, there are three components of funding of expanded higher education systems that ensure universal access: public funding, tuition and philanthropy. However, government policy completely ignores the major historical role of philanthropic donations to institutions, although most of the physical development and some research, are still funded by philanthropy. Instead of encouragement and recognition, there is alienation and indifference. Clear, encouraging policy is required on this issue.

## Specifics and Data Analysis

The task force has estimated the scope of the system's long-term needs in terms of input and output (budgets, students and basic research needs). The basic model chosen takes into consideration the primary variables that produce student growth per institution, especially natural increase (including immigration); the advisable increase in the number of recipients of matriculation certificates; and the demand for advanced and professional studies.



These estimates take into consideration the needs of the education system and the Israeli economy, as detailed in previous chapters, and merge with the data on the academic and technological labor force required for leading the Israeli economy towards accelerated growth and placing it at the forefront of developed countries.

In order to achieve Israel's development objectives, there is an urgent need to change priorities in education. Formal education requires urgent promotion, along with high school students' preparation for entrance into the higher education system. Therefore, and in view of the past five years' stagnancy in matriculation eligibility, we must prepare and encourage a significant increase in 18-24-year-olds eligible for matriculation. Seemingly, past figures indicate a significant improvement in the rate of matriculation over the past two decades, but the data is relative to the low level seen in the past, and does not indicate an improvement in relation to the Western world. Israel is currently at the bottom of the list of developed countries in the relevant population's eligibility for matriculation. The proportion of matriculates of the relevant ages is under 50%.

Therefore, a forecast is required for setting a clear, defined target for a significant breakthrough. That is, setting ambitious, attainable objectives for the next twenty years, with different alternatives that will provide a response to the primary factors in the demand for higher education; natural increase, rise in matriculation rates, increase in the demand for advanced degrees, and more.

The plan examines a number of alternatives, but in fact, the economic growth target of over 6% per annum requires adopting the higher objective. The current number of students is about 250,000 for 2008. The time frame for planning and testing alternatives is the next twenty years:

- **The maximal alternative sets target to increase the number of students to about 610,000 students in 2028, in such a composition and according to parameters described below. This is the alternative required for fulfilling the vision of this plan.**
- The middle alternative sets a target of 460,000 students in 2028, in such a composition and according to parameters explained below. While this alternative requires significant effort, it is insufficient for raising Israeli economy and society to the high position to which we aspire.
- The minimal alternative sets a conservative target according to existing trends, sufficing with about 390,000 students in 2028, according to the composition and parameters explained below. This alternative is presented to emphasize the large gap between it and the alternative that is in fact required for positioning the Israeli economy at the desired high international level. The minimal alternative will not enable the leap forward required for achieving the objectives presented in this plan.

The leading variable among the different alternatives is the matriculation rate of the relevant age group, and the increase in the demand for Master studies. The increase in the matriculation rate is an urgent, crucial necessity for changing priorities in the education field.

The forecasts relate to bachelors, masters and PhD programs, non-budgeted colleges, and upgrading post-secondary institutions to two-year or three-year institutions that confer Associate degrees.

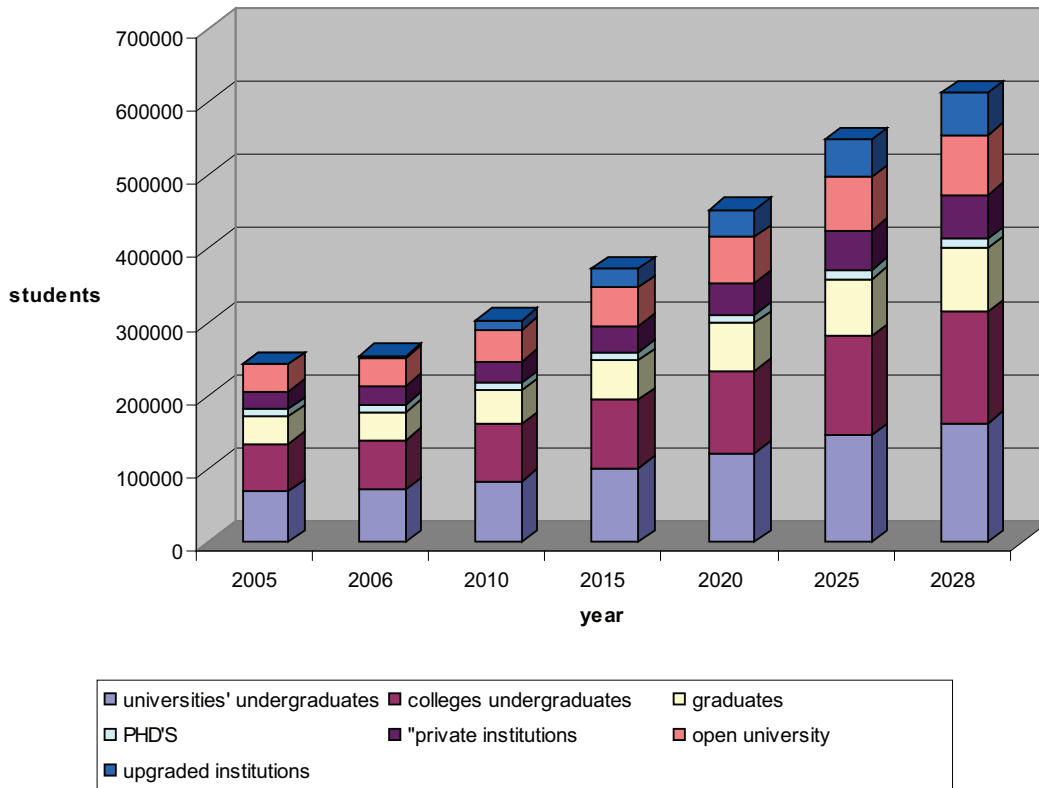
Along with the forecast for the rise in the number of students, objectives are also presented for budget increases over the next twenty years. Increasing the budget requires a real increase in investment beyond the rise in the number of students, in order to achieve objectives for research and international excellence objectives.

Table 1 (with Chart) summarizes the forecast for the number of higher education students for the maximal alternative.

**Table 1:  
Forecast for Increase in Number of Students – Maximal Alternative**

Forecast summary of increase in higher education students 2008-2028							
Academic year	2005	2006	2010	2015	2020	2025	2028
<b>BA - universities</b>	69,840	72,459	83,955	100,922	121,318	145,837	162,866
<b>BA- funded colleges</b>	64,733	67,160	77,816	93,542	112,447	135,172	150,957
<b>MA</b>	37,330	38,730	44,874	53,943	64,845	77,951	87,053
<b>PhD</b>	9,340	9,480	10,062	10,839	11,677	12,580	13,154
<b>Non-budgeted colleges</b>	24,322	25,295	29,591	36,003	43,803	53,292	59,947
<b>Open university – all degrees</b>	36,950	38,243	43,885	52,122	61,904	73,523	81,516
<b>Upgrading institutions</b>		2,500	12,500	25,000	37,500	50,000	57,500
<b>Total</b>	242,515	253,868	302,683	372,371	453,494	548,354	612,993

**Chart 1:  
Development of Increase of Students for 2028  
by Category & Institution**

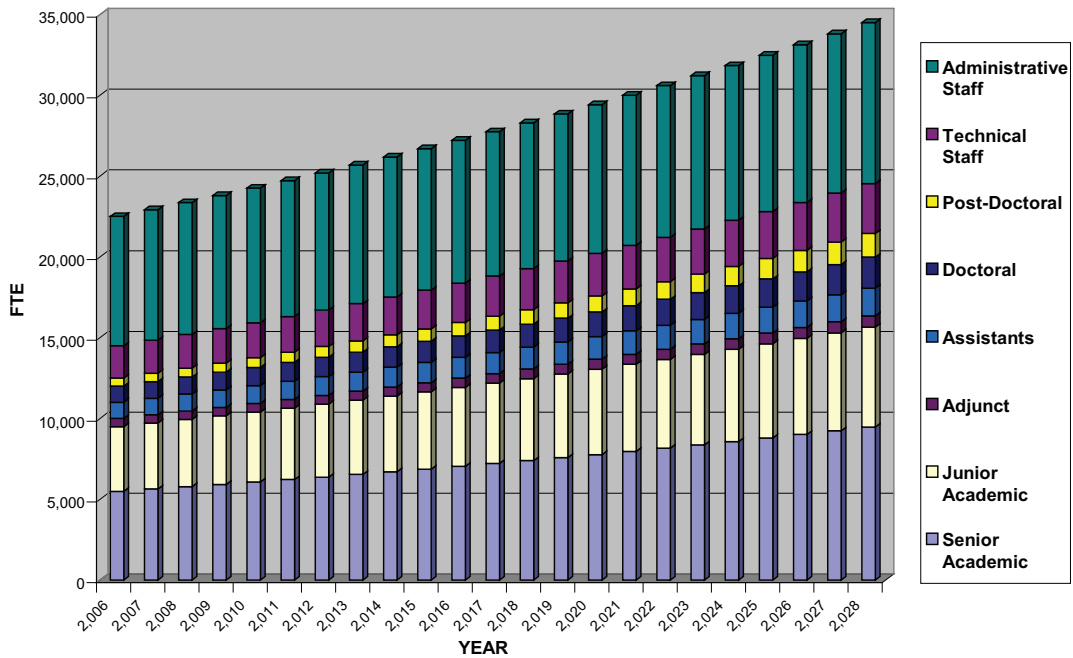


Increase in the number of students clearly requires a corresponding increase in academic and other staff in the system as presented in Table 2 and Chart 2.

**Table 2: Forecast for Staff Increase 2007-2028 - FTE**

Required Staff Increase for 2028 - FTE	
Senior faculty	9,500
Junior faculty	6,200
Adjunct	700
Teaching assistants	1,700
Doctoral students	1,900
Post-doctorates	1,500
Technical staff	3,100
Administrative staff	10,000
<b>Total</b>	<b>34,500</b>

**Chart 2: Forecast for Academic and Other Staff Increase**



The necessary increase in various degrees granted in order to achieve the plan's strategic objectives is given in Tables 3 and 4, while Table 3 shows the needed additional budgets, and Table 4 the detailed calculation.

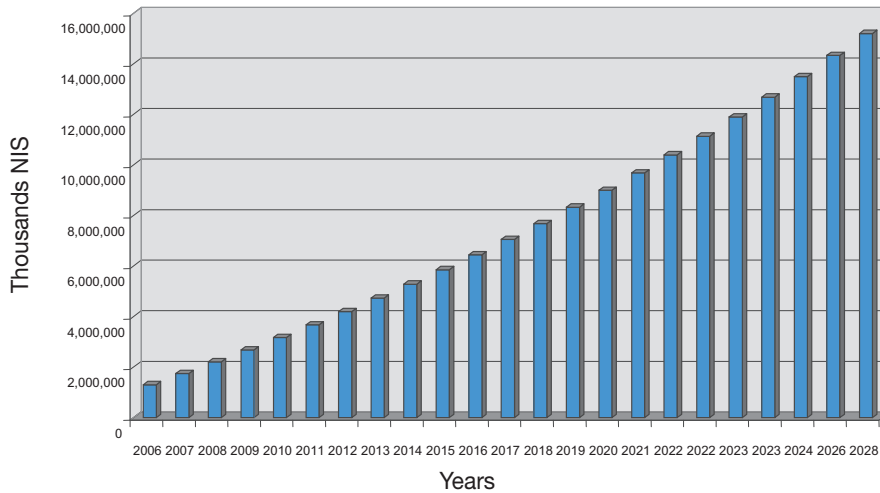
**Table 3: Factors in the Increase Rate by Degree**

Degree	Parameter	Yearly rate of increase
BA	population increase	1.5%
	Immigration	0.5%
	Matriculation increase	1.75%
MA	population increase	2%
	Immigration	0.5%
	Matriculation increase	1.5
PhD		1%
Open university		3.5%
Upgrading existing post-secondary institutions		5%

**Table 4: Itemized Required Budget Supplement for 2028**

In thousands NIS

Details/years	Unit Rate	Unit of measure	2006	2007	2015	2028
<b>BA- University</b>						
Increase in students	35	Matric. Student	91,665	186,767	1,087,865	3,255,913
Improving teaching	0.1	Classroom crowding coefficient	9,167	18,677	108,787	325,591
<b>Total</b>			100,832	205,444	1,196,652	3,581,504
<b>BA- budgeted colleges</b>						
Increase in students	25		60,687	123,650	720,226	2,155,590
Improving teaching	0.1		6,069	12,365	72,023	215,559
<b>Total</b>			66,756	136,015	792,248	2,371,150
<b>MA</b>						
Increase in students	65	Matric. Student	90,992	185,396	1,079,877	3,232,004
Improving teaching	0.1	Improving adjunct-senior staff ratio	9,099	18,540	107,988	323,200
<b>Total</b>			100,091	203,936	1,187,865	3,555,204
<b>PhD</b>						
Increase in students	150		21,015	42,345	224,918	572,136
Doctoral scholarships	0.1		2,101	4,235	22,492	57,214
<b>Total</b>			23,116	46,580	247,409	629,350
Open University	10	Matric. Student	12,933	26,318	151,716	445,659
Upgrading institutions	20	Matric. Student	50,000	100,000	500,000	1,150,000
strengthening research	100	Allocation for researcher	550,000	563,750	686,875	946,864
Student aid	5	Matric. students	56,763	115,166	649,280	1852,389
Construction	30	7 sq. meter per student (@ \$1000/sq.meter)	340,578	350,418	443,581	667,383
<b>Total added expenditure</b>			1,301,068	1,747,627	5,855,626	15,199,504
<b>Funding</b>						
Increased tuition	15	Matric. students	155,696	315,728	1,772,632	5,022,795
Supplementary PBC budget		Complementary Self-income	979,948	1,209,850	3,344,257	8,279,983
Self-income	5	Matric. students	51,899	105,243	590,877	1,674,265
Construction-donations	10	7 sq. meter per student (@ \$1000/sq.meter)	113,526	116,806	147,860	222,461
<b>Total added income</b>			1,301,068	1,747,627	5,855,626	15,199,504

**Chart 4: Required Budget Supplements until 2028**

## Recommendations

### 1. National Policy

The higher education system will remain public, supported mainly by government sources. It will be the state's duty to influence and direct the shaping and implementation of the system's development policy, in order to achieve the primary objectives of promoting Israel's values, standards, economy, and security. The state's impact upon the direction and development of the system must be founded on non-political public/academic principles, as fits an enlightened state.

Over the next twenty years, a higher education system with a changed structure should gradually be created. The system will include at least two elite research universities, whose academic achievements place them among the twenty leading institutions in the world. We do not intend to choose two institutions to be designated as these elite institutions; rather, funding policy should be promoted that creates competition among all universities. As a result, it is likely that at least two universities achieve elite university status. In such an open competitive process, clearly all universities will be able to promote fields of study and centers of excellence. In addition to the elite universities, the system will include a wide variety of academic institutions: universities that confer all degrees, an open university, academic colleges and two-year community and vocational colleges – all of which operate side by side, promote competition, strive for excellence, and complement each other in

certain realms. The system must be open to students' convenient transition between its components, according to their ability and will, and must charge fair tuition. It will enable the majority of the population in the appropriate age groups to participate in the higher education experience, so that by 2028, over 75% of the relevant age group will be enrolled in the system, reaching 610,000 students in 2028 (up from the current 250,000), by the institutional breakdown provided in Table 1.

## 2. System Budgeting and Funding Policy

Attaining the higher education system's objectives according to the recommended alternative requires that government budgets be increased already, as well as for the mid - to long term. This will minimize the damage caused by the cuts of recent years, match the increase in the number of students to the teaching needs of various degree programs, and nurture research excellence. As compared with the current situation, the system's budget resources from government sources must be increased by no less than NIS 2.5 billion for the base budget over the next five years (as per the Shohat Commission report, "Examination of Israel's Higher Education System"), as well as an additional increase of about NIS 2.5 billion for the base budget for each of the three upcoming five-year periods, so that in twenty years, the system's base budget will be about NIS 10 billion larger than at present. These budgets must be designated for improving the system's outputs in teaching and research as well as improving access to the system, as will be detailed below. These budgets correspond to the demands of the maximal alternative.

**Budgeting for university and college teaching will be transparent, based primarily on the number of Bachelors and professional Masters students, and will vary by discipline. A certain gap will exist in the same discipline between university and college.**

**Budgeting university research will be done almost exclusively through competitive research foundations: the Israel Science Foundation and additional designated research foundations that should be established. These foundations' budgets will come from re-directing CBP's institutional research funds (currently allocated to universities, in the framework of their regular budgeting, according to criteria such as the number of advanced-degree students, publications, etc.), competitive research foundations, as well as significant augmentation of the Ministry of Finance's overall allocations for scientific research. Research grants will include about 40% of overhead costs designated for the academic institution. Likewise, researchers will have to fund scholarships for their advanced-degree students out of their research budgets.**

## 3. Expanding National Foundations for Scientific Research at Universities

The national foundations for scientific research at universities need to be expanded and enhanced, as indicated in Chart 4, in order to attain the supreme goals for research quality,



and to have at least two elite universities classified among the world's twenty best. In addition, high-level research must be done at universities that confer advanced degrees. In order to achieve these main objectives, two directions need to be taken. First, the scope of funds for competitive basic research based on exclusively on excellence must be significantly expanded. Existing foundations must be enhanced and new foundations and programs must be created at a yearly budgetary scope of an additional approximately NIS 1 billion. The increase in research budgets is an essential condition for improving Israel's academic research, in order to enable it to be internationally competitive and to attract the strongest scientific forces to Israeli institutions.

Second, a system of national foundations must be established for specific research fields. The Israel Science Foundation has proved itself as the leading foundation for basic research. This foundation, which supports outstanding research on a competitive basis, is an important factor in promoting basic research in Israel. The foundation's leap forward occurred in 1992, when it was expanded by the initiative of the Israel Academy of Sciences and Humanities and PBC, and was upgraded for basic research and expanded by hundreds of percentage points. However, progress in world science, the need to build large-scale research groups and the need to create means for research and large-scale designated research infrastructure, all require an additional significant expansion of the foundation's resources, in order for Israel to maintain its status as a leader in world research, and to excel in fields in which it has comparative research advantages. Such a budget increase is also deemed necessary by international comparison to national science foundations in other small, developed countries, such as Switzerland and Sweden. At the same time, new financial sources need to be allocated from the budgets of the higher education system, the Finance Ministry and other budgets (Ministry of Health, Ministry of Energy and others), to promote research in fields in which there are gaps in knowledge and standards, so that within this strategic plan's time frame, we can arrive at personal and institutional competitive research funding at a scope of \$1 billion. We note that the scope of research at one elite university in the US can range between \$500 million and \$1 billion.

The routes to expanding the system of national science foundations for research will include:

- Reinforcing the Israel Science Foundation, which is based on competitiveness and excellence, in order to enhance support for research excellence by researchers and research groups, and to establish competitive institutional research infrastructure, without institutional considerations.
- Establishing additional competitive foundations in specific fields, one for medical research and the second for the humanities. These funds may function in the framework of the Israel Science Foundation.

- Establishing foundations or programs for designated research in specific fields (such as nanotechnology), to be funded by pooling government and university resources.
- New financial resources need to be allocated from the budget of the higher education system and other budgets (Ministry of Health, Ministry of Energy and others) for the advancement of research in fields that have gaps in knowledge and standards. In this context, we must also develop a bio-medical research foundation based on the existing knowledge infrastructure at Israel's medical centers, which are not utilized at all or only minimally. Establishing a foundation to unite medicine and the life sciences will advance medical research and enable physicians to take a significant role in research, as compared with the current situation.
- Research should be nurtured in the humanities in general, and Jewish studies in particular.
- Israeli science's connection with world science in the framework of international organizations and institutions should be promoted. Management of these relationships should be concentrated in the framework of the Israel Academy of Sciences, in cooperation with the Ministry of Science.

#### 4. Regulatory Bodies

The state provides the higher education system with considerable resources, and will have to provide even greater resources in the future. Therefore, it is not only permitted to influence and guide the system, but is obliged to do so. This is currently done through the two regulatory bodies established by the state: CHE and PBC. Over the years, these bodies have supervised and managed the system with considerable specific involvement in institutions' business. In view of the system's current size, and certainly in the future, when the system grows significantly, direct, specific control and intervention in micro-management will no longer be appropriate. It would require the establishment of a large, very awkward bureaucracy. **The advisable alternative is redefining the roles and powers of the CHE and PBC and delegating broad powers to the institutions.**

CHE cannot respond in reasonable time to the numerous applications for starting new programs of study and new institutions. Also, the method of establishing ad hoc committees for each request is slow and problematic. Therefore, CHE also needs to delegate some of its powers regarding the creation of new study programs and conferring of new degrees by recognized institutions, to the institutions themselves, in turn shortening and simplifying procedures, even if this has budget implications.

PBC must navigate the system via judicious, clear and transparent funding policy, as described above, providing broad powers to institutions, without its specific intervention. At the same time, it must focus on monitoring the institutions' outputs.

As for the establishment of new institutions, study programs and degrees at unrecognized institutions, **an additional CHE sub-committee should be created. The exclusive role of this professional, skilled sub-committee will be to make recommendations to CHE (in coordination with PBC) on issues pertaining to institution licensing, conferring of degrees and monitoring outputs of the entire system.**

Transferring powers to universities and colleges as regards programs of study and conferring of degrees places the responsibility for monitoring and quality assurance on these institutions. Thus, they will take it upon themselves to conduct external academic monitoring of each department and faculty once every six years. The evaluating committee's report will be transferred to CHE via the new sub-committee. In addition, the new sub-committee, in coordination with PBC and CHE, will be able to make an occasional request to the Israel Science Foundation to initiate a survey of the fields of scientific research at a national level.

## 5. System Components

The higher education system is currently composed of two main tiers: universities and colleges. The proposed higher education system will have three main tiers: universities, colleges, and two-year community colleges. The system must allow easy transition for students who meet demands, from tier to tier, and universal entry to the two-year colleges. Such a structure will enable the attainment of the national universal access target of 75% of the relevant age group enrolled in higher education. Every type of institution has a defined, complementary designation and mission, as detailed below.

### 5.1 Universities

The universities have a multi-dimensional role, which includes a) promoting human knowledge; b) educating and training national leadership in all disciplines at the Bachelors level and beyond; c) creating modern technologies and training high-level scientists, academics and executives; d) distributing knowledge and establishing progress and enlightenment; e) shaping and maintaining our national and cultural foundations; f) serving society's need for decreasing gaps; and g) building bridges to world science and to world Jewry.

As detailed above, through appropriate funding policy we must strive for **at least two** universities to be positioned among the world's twenty leading universities.

In order for universities to fulfill the mission described above, they must maintain high entry thresholds and filter candidates through accepted exams. They must maintain a student-to-faculty ratio that allows for appropriate teaching standards at all degree levels.

As universities are public and publicly-funded, and in order to provide equal opportunity for the periphery and minority sectors as well, **universities must accept, without**

**exams, 2% of those eligible for matriculation who have scored highest among the country's high schools. They will also have to accept college students who show acceptable university-level achievement and who are interested in continuing their studies at university.**

A management model appropriate for the university's needs should be examined. University management will require expanded powers to set faculty pay, and to conduct negotiations and agreements with faculty, while setting clear rules for their budget responsibility. Management's control over academic faculty's pay, along with dramatic improvement in research conditions, will provide universities with the necessary tools to prevent a brain drain and to bring back talented Israeli scientists from abroad.

It is important to emphasize the considerable role of the research university in developing applied R&D. Although most industrial R&D is currently done through business and government involvement through the Chief Scientist in the Ministry of Industry, Trade and Labor, its foundations are in basic research and researchers' connections with industry. Moreover, one of the characteristics of the 21<sup>st</sup> century is the merging of science and technology into an indivisible entity; therefore, it is expected that most important breakthroughs will come from universities' basic research. The connection between universities and industries was supposed to be conducted through university R&D companies, which exist at most universities and fulfill an important role in transferring knowledge to industry. There is an urgent need to promote the issue by setting clear intellectual property policy that provides an incentive to the solitary researcher to commercialize his or her studies, and enables the university to promote science and technology to applied and commercial tracks, without state intervention. We recommend encouraging university subsidiaries, through competitive foundations, to upgrade basic research and transfer of the knowledge to industry.

Finally, we note a uniquely Israeli problem. Select military intelligence units, such as 8200, employ a significant number of Israel's most scientifically-talented young people. They serve in the military for extended periods at the precise age at which scientific ability should be nurtured. Due to this defense need, Israel certainly loses a large number of outstanding scientists. In order to mitigate the damage to Israeli science, we recommend that the Israel Academy of Sciences and Humanities take up this matter with the IDF and universities, and create special multi-university study programs with the finest scientists as lecturers at IDF camps, so that by the end of these young people's military service, they will have completed at least a Masters, perhaps even part of a PhD.

## 5.2 Academic Colleges

Colleges must continue to focus on awarding BA, and sometimes BS, degrees; those that prove their comparative advantage may award Masters degrees, typically of a professional nature. PBC-funded colleges need to arrive at a critical mass of students and faculty; otherwise they may be closed or merged with other institutions.

Colleges will be allowed to set students' acceptance criteria. However, publicly-funded colleges must accept candidates from community colleges who have passed exams (coordinated with them), and high school students eligible for matriculation, whose matriculation scores were at the top third of their class. This will ensure that relatively strong students at peripheral schools are accepted into college without entrance exams.

The primary role of college faculty is teaching. College academic rankings must be determined by the colleges themselves, in procedures set by them, the primary criteria being teaching, innovation in teaching, scholarship and contribution to the college.

Like their colleagues at universities, college teaching faculty requires continuing education. We propose that PBC create a competitive foundation for this purpose that will fund a stay of a semester to a year in the framework of one of the research universities in Israel, with visiting lecturer status.

We do not recommend that colleges be run by or employ for a long period an excessive number of university professors. Colleges should be different from universities. It is advisable that management and faculty be made up mostly of people whose primary interest is the college.

College faculty members will be free to apply for competitive research funding, on the condition that they have proper research infrastructure or that they are allowed to use existing university infrastructure, on an ongoing or designated cooperative basis. Colleges will not be allowed to apply for competitive infrastructure grants.

## 5.3 Community Colleges

As stated above, achieving universal access requires the formal addition of a third tier of higher education, that of two-year community colleges. There are currently about sixty institutions of this kind. These colleges will focus on three directions: a) professional tracks that prepare graduates for specific professions (technicians, practical engineers, nurses, dental technicians, photographers, etc.). Many such programs currently exist. The colleges will determine the entry criteria for these programs; b) preparing students who either do not have matriculation certificates, or have only partial matriculation or

insufficient grades for acceptance into colleges and universities. These are the various preparatory courses; and c) general studies for ongoing education. In the latter two tracks, entry will be open to all.

Community colleges will award the preliminary Associate's BA or Associate's BS degree. Colleges and universities will set rules for accumulating certain credits for community college studies.

The addition of these colleges to the system and expanding their activity can provide important leverage for a) the entrance of ultra-Orthodox young people into the labor force (see below) and b) making the services sector and traditional industries more efficient. These challenges certainly demand that numerous new community colleges be established, designated for specific professions. As this topic requires more clarification, we propose to establish a committee that will examine it in depth.

#### 5.4 Foreign Extensions and Private Colleges

Private colleges and extensions of foreign universities are a positive phenomenon, as they regulate supply and demand, deserving of encouragement as long they maintain adequate standards. CHE will provide recognition of the degrees they award, via a new sub-committee to be established for this purpose. Private colleges should have freedom of action, but their awarding of degrees should be supervised.

### 6. Tuition

In principle, tuition at publicly-funded higher education institutions should maintain a reasonable balance between the acquired education's contribution to the individual and its contribution to society, taking into consideration the individual's ability to bear the burden. There is no simple formula for this balance. We propose a uniform tuition for Bachelors studies in each tier, which reflects half of the cost of teaching in the least expensive field in that tier. In this way, education's contribution to the individual's earnings potential and to the goal of state and society to train an educated, skilled labor force, are both expressed. Tuition for the Masters degree will be higher. In addition, **we propose that every IDF and national service veteran receive a year of education free of charge per each year of compulsory service.** A support system for students in need, including loans for all students, should also be created.

### 7. The Ultra-Orthodox Sector

Labor force participation by the ultra-Orthodox sector, whose share in the Israeli population is expected to increase significantly, is a near-prerequisite for attaining the supreme goals of the strategic program proposed in this plan. The higher education system must play a

central role in fulfilling this task. In light of this sector's inadequate preparation in basic skills required for higher education (math, science and English), community colleges, especially professional ones, are an appropriate instrument for promoting this goal, due to their relatively short study period, the fact that the study content does not conflict with their beliefs, and the opportunity they offer to be absorbed in the labor market at the completion of studies. If existing professional community colleges cannot respond to the needs in terms of size and geographical distribution, we recommend establishing new colleges in densely-populated ultra-Orthodox areas such as Bnei Berak and Jerusalem.

## 8. The School System and Higher Education

Higher education is based primarily on the formal school system, from elementary to high school, and preparation for matriculation exams. An essential but insufficient prerequisite for the existence of a quality, accessible higher education system is the building of a quality school system that trains the student for independent learning and creative thinking, and serves as a knowledge infrastructure and strong foundation for academic studies. We must also promote professional studies and practical training.

Higher education must make an essential contribution to improving formal schooling's objectives and content. It must encourage and guide enhanced teaching standards in high schools in all subjects. This can be done through greater involvement in shaping school curricula and better preparing students for academic studies.

Improving the standard and quality of studies for all students and populations in Israel will facilitate the expansion of access to higher education without compromising academic excellence. There is a crucial, urgent need to increase the number of recipients of matriculation certificates by 1.75% a year, beyond the natural increase of the relevant age group, while maintaining appropriate pedagogical standards.

## 9. The Role of Philanthropy

As stated, philanthropic donations to universities and colleges play an important role in these institutions' income, especially as regards physical development. New buildings, student dorms, renewing equipment, acquiring expensive research infrastructures for universities, and other many activities are currently done through philanthropic support. In addition, scholarship foundations and faculty chairs by philanthropic endowments support research budgets and institutions' current budget. All of this produces very significant savings to the public treasury. It is also important to note that as opposed to the US, where support of academic institutions comes mostly from their alumni, in Israel most of the support does not come from alumni or from affluent Israelis, but rather from world Jewry, especially from the US. This support is important not only in itself, but also in its creation of an ongoing,



warm relationship between Israel and the Diaspora. This phenomenon is especially important in a period when the connection between Israel and the Diaspora is weakening. **We recommend that this issue be examined in depth, in order to develop national tools for encouraging philanthropy and recognizing those involved. Philanthropic donations to higher education institutions should be viewed as an important, central element in their funding.**

## 10. Promoting Social and Cultural Values

We must take into consideration that an important part of higher education is not measured in terms of training manpower for the labor market, or adapting the scope of studies to economic market variables. This statement particularly characterizes the humanities and other general studies. Promotion of teaching and research in the humanities, social sciences and Jewish studies should continue, by directing research funds to this issue and encouraging teaching in these fields at all institutions and for all degrees, in order to preserve and promote Israel's cultural treasures.