

CHAPTER 22

Summary of the Colloquium

James J. Duderstadt and Luc E. Weber

The VIII Glion Colloquium was held in June 2011 to consider the roles that could be played by the world's research universities in addressing the various challenges of global sustainability in the broadest sense, e.g., climate, environmental, economic, health, poverty and geopolitical. This included considerations not only of how research universities were adapting to the imperatives of global sustainability (e.g., social diversity, resource management, academic programs, research and scholarship), but also how they could develop new curricula, student experiences, research paradigms, social engagement and international alliances to better address the challenges of global sustainability, while producing globally identified citizens.

Participants prepared papers that were distributed in advance of the meeting to allow time for wide-ranging discussions. The meeting was divided into five major sessions, with an opening keynote address provided by Anne-Marie Leroy, Group General Counsel of the World Bank. An additional panel discussion was scheduled involving leaders of the European University associations to discuss the current state of research universities in Europe.

This summary chapter has been written to pull together several of the key points made by the participants and arising during the discussion phase of the sessions.

THE KEYNOTE ADDRESS OF THE VIII GLION COLLOQUIUM

Anne-Marie Leroy: How Can Research Universities Contribute to Fostering Sustainable Societies in Developing Countries?

In a sense, “global sustainability” is the end point along the continuum from “environmental sustainability” to “sustainable development” to a “sus-

tainable society” and ultimately, “global sustainability”. Robert Zoellick, president of the World Bank, sets the challenge as leveraging the opportunities that increased global interconnectedness offers to overcome poverty, enhance growth with care for the environment, and create individual opportunity and hope in working towards this vision of an “inclusive and sustainable globalization”. At its core, this implies a sense of equity, and therefore, a prominent role for the mediating power of the law. We must learn to appreciate the law in its proper socioeconomic context and allow it to become a key and meaningful element in the development imperative.

Research universities can play a key role in working with the development community to find innovative solutions to the development challenges. Together, we must find ways of developing viable methods of analysing the law through different lenses to determine its adequacy and effectiveness, taking into account the political, economic, social and cultural contexts in which it operates.

For example, how do we help build legitimate and effective legal and judicial institutions in post-conflict and fragile situations, considering the low institutional capacity, infrastructure and other limitations? How do we design appropriate legal frameworks to deal with environmental crimes such as illegal exploitation of marine resources, wildlife poaching, deforestation, pollution and so on? How do we harness international law in order to provide answers to situations where new States are emerging (for example South Sudan) and the so-called “failed States” (such as Somalia) become fertile ground for regional instability? How do we respond to the global financial crisis through domestic and international legal and regulatory reforms? How can we ensure that land and property rights systems (including intellectual property rights) provide adequate protections for the most vulnerable and do not hinder meaningful economic development? How can the law contribute to enhance transparency, citizenship involvement and accountability?

Partnerships and knowledge networks provide an important vehicle for research universities to become engaged in international development. As a specific example, universities are invited to partner with the World Bank’s Global Forum on Law, Justice and Development.

SESSION 1. ELEMENTS OF GLOBAL SUSTAINABILITY

Chair: Charles Vest

Luc Weber: Universities, Social Sciences, Arts and Humanities, Key Pillars of Global Sustainability

Jared Cohon: Values and Valuation for Sustainability

Thomas Bierstecker: Contemporary Global Governance and the Challenges of Institutional Reform

Pascal Morand: Responsibility of Business Schools to Train Leaders Sensitive to Global Sustainability

Today, there is growing evidence that an ever-increasing human population and invasive activities of humankind are altering the fragile balance of our planet. The concerns are both multiplying in number and intensifying in severity: the destruction of forests, wetlands and other natural habitats by human activities leading to the extinction of millions of biological species and the loss of biodiversity; the build-up of greenhouse gases such as carbon dioxide and their possible impact on global climates; the pollution of our air, water and land. Yet, while most attention is focused on the changes humankind is forcing upon the natural world, one must also question the sustainability of human societies themselves.

The concept of sustainability, well established in the domain of environmental protection, exploitation of natural resources and climate deterioration, is equally powerful as a wide-ranging concept pinpointing the necessary sustainability of geopolitical, economic, financial, and social structures — even the university itself — which are required for world prosperity and peace. In this sense, sustainability has two distinct dimensions: first, a natural one, focusing on planet Earth, the environment, the exploitation of natural resources, including air and water, and the climate; and second, a human and societal one, referring to the well-being of human beings and the economic, political and social organization and development of society.

Our traditional social and economic organizations, such as governments and corporations, tend to come up short in weighing the full range of issues that should influence policy development and economic decisions. Given the complex interdependence of our contemporary world, the challenges of contemporary global governance are daunting. The task is made all the more difficult because most of the international institutions we still rely upon to manage contemporary global challenges were created and designed more than 60 years ago. They were profoundly state-centric in their governance and design and created with very specific purposes in mind. Today the costs of their inability to cope with the growing challenges to global sustainability are enormous.

One of the keys to sustainability is “getting the prices right”, that is, addressing externalities such as the true social costs of various options that are not reflected by the prices set by markets. For example, the dominant non-climate external effect of energy use is its damage to human health, primarily excess deaths from air pollution. But determining the magnitude of such externalities is difficult, as evidenced by the recent U.S. National Academy of Sciences study that estimated additional costs of utilizing fossil fuels to produce energy in the U.S. at \$240 billion/year currently not reflected in the marketplace, a clear market failure that the U.S. government has been unable

to address. More fundamentally, these are really issues of estimating “values” of different practices and options in a careful and rigorous fashion. For example, how do we value the welfare of future generations or our intergenerational responsibilities? Few would disagree that these are value questions. But who sets the values? Politicians? Economists? The public at large? Or universities?

After all, virtually every member of governments and almost all CEOs and leaders of every sort has spent some part of his or her life in our universities. Surely, we, the academic community, have contributed to the way society values nature, for good or ill, and we can help to shape how it will view nature in the future. Yet, we also must accept some blame for the absence of value discussions, since we have largely eliminated values and ethics from our schools and colleges, pushing such considerations into broader society where they become more contentious. Considerations of values and ethics have largely disappeared from our academic programs, particularly in professional schools such as business administration.

The concept of sustainability is to some extent inherently at odds with the cultural mantra of freedom, accepted widely in Western society and particularly in the U.S. If freedom or “liberty” is a core value, and it means being able to do anything you want to maximize your happiness and success, independent of the impact of your actions on anyone else, then the concept of sustainability may threaten your core values. Since business and industry play such a key role in both threatening and mitigating global sustainability, university business schools have important roles to play in providing their students with a framework of values and integrity that extends beyond profit to include environmental and social welfare.

Of course, it would be inappropriate to suggest that universities should dictate values to their students. As a starting point, we can suggest that some level of environmental literacy should be a basic goal of our curricula. Being sure that every student has some basic understanding of environmental issues and phenomena seems desirable. This requires broader considerations than the natural sciences. The social sciences are essential to the study of social organizations and communities. Some consideration of the arts and humanities must be an essential component of education if one is to acquire the perspective necessary to understand and estimate values characterizing complex issues such as global sustainability. The university is where these disciplines can be best pulled together to address the issues of global sustainability.

Today, universities have become key drivers of the knowledge society, with responsibilities to provide ever increasing educational opportunities, to perform the research necessary to address social needs and priorities, and to provide a mechanism for reasoned debate and policy development concerning major issues such as climate change. Hence, it is natural to add to these roles a responsibility to provide students with the understanding and values necessary to embrace global sustainability.

SESSION 2: THE CHALLENGES OF GLOBAL SUSTAINABILITY TO UNIVERSITIES

Chair: Heather Munroe-Blum

Charles Vest: Strategy in the Face of Uncertainty and Unpredictability: The Research University Role

James Duderstadt: Global Sustainability Challenges: Timescales, Magnitudes, Paradigm Shifts and Black Swans

Yuko Harayama: Over the Horizon: Addressing Global and Social Challenges and the Role of Universities

Ralph Eichler and Patrick Aebischer: Action Is What Counts: Sustainability at ETHZ Zurich and EPFL Lausanne

The uncertainty and imperfect predictability characterizing complex physical and biological phenomena cause havoc when fed into social and political decision-making systems on issues such as climate change. It appears that democratic systems have particular difficulty dealing with strategic issues to begin with, and these difficulties are only compounded when the forcing functions that need to be recognized by strategies have non-trivial uncertainty.

Despite the increasing confidence on the part of the scientific community that activities of humankind are changing the climate of the planet, there remains substantial public opinion that denies the reality of both climate change and human impact. Part of the challenge in shaping both public understanding and policy concerning global climate change issues is the difficulty of conducting rational discussion of concepts such as severity of consequences and probability of occurrence. The situation that causes particular consternation is one that has a very low probability of occurrence, but has potentially disastrous consequences, such as the blowout of the BP Deepwater Horizon well in the Gulf of Mexico in 2010 or the impact of the massive 9.0 earthquake and tsunami on a Japanese nuclear power plant in 2011.

Unfortunately, many of the phenomena we need to consider today are not inherently certain, and to make matters worse, we usually have rather incomplete information to begin with. Climate change is even more complex. Its prediction is inherently probabilistic. Even our understanding of the past and present is probabilistic. Climate change depends on nonlinear interactions of many subsystems of the climate and on various forcing functions that are complicated to understand.

How do we tackle these global challenges, while increasing the quality of life and leaving room for development? To deal with these market failures, traditional policy tools — incentive tax, subsidies or regulation — may be mobilized in theory. So, too, part of the challenge is to understand better public perception and misconceptions so that issues can be reframed in terms that

will engage even sceptics in a constructive dialogue. It was noted that one issue that seemed to persuade even the strongest sceptics of global climate change was the recognition that “green energy” industries would soon comprise one of the largest economic sectors in the world. Without at least some attention to these technologies, nations would be largely left out of this marketplace.

In those rare instances in which both public understanding and scientific agreement have converged, effective policies have been developed, such as the Montreal Protocol addressing depletion of the ozone layer by limiting the emissions of CFCs. The policy development for re-combinant DNA experimentation involved a similar process involving scientists, government leaders and industry.

Yet, today, we have a difficult time in engaging in open discussion of issues such as global sustainability. Both politicians and scientists discuss whether or not they *believe* that climate change is real and if so, whether or not they *believe* that it is caused in large measure by human actions. In far too much of the discourse in the United States, *belief* has taken on a connotation of a religious-like, or ideological belief, rather than implying whether or not scientific observation and analysis are sufficient to form a basis for policy.

Our current inability to generate sufficient concern and action to address the challenge of global sustainability may be due in part to the difficulty we have in comprehending the timescales, magnitudes and paradigm shifts characterizing phenomena such as energy production and climate change. We usually think in terms of the timescales characterizing our own experiences. For example, businesses tend to function on timescales determined by quarterly earnings statements and policy evolves on timescales of election cycles. We tend to think of natural phenomena, such as climate change or biological evolution operating on very long timescales, thousands or even millions of years. But all of this is changing, with serious implications for global sustainability. While the time frame for major damage is not immediate, the necessary risk mitigation requires near-term action to stem problems that would occur decades into the future.

We also have problems with magnitudes. For example, it is estimated that over \$16 trillion in capital investments over the next two decades will be necessary just to expand energy supply to meet growing global energy demand driven by the energy needs of developing economies. A second example of just how magnitudes influence global sustainability is demographics. The United Nations has recently updated its projection of world population growth to 9.3 billion by 2050 and to over 10 billion by 2100. This raises the logical question: Can we sustain a population of such magnitude on Spaceship Earth?

The forces driving change in our world — anthropogenic driven changes in our environment (climate change, declining biodiversity), changing

demographics (aging populations, migration, increasing ethnic diversity), environmental impact (climate change, biodiversity), globalization (economic, geopolitical, cultural), and disruptive technologies (info-bio-nano technologies) — are likely to require a new level of knowledge, skills and abilities on the part of our citizens. In the face of these and other realities, universities have important roles in not only conducting the research necessary to reduce uncertainty, but also to help both policy-makers and the broader public to understand the nature of risk and to assist in developing better social and political means to discuss uncertainty and risk.

More generally, tackling the challenges of sustainable development requires critical thinking, innovative technologies and an open dialogue between science, industry and society. Universities can play the role as “honest brokers”, providing impartial scientific information to all parties concerned, with due emphasis on the assumptions and uncertainties that are unavoidable in all scientific studies. They can also act as role models for the decarbonization of society by sharing their own operations management techniques and fostering a sustainable campus environment for working and living.

To be sure, the traditional roles of the university will continue to be important, but they also must evolve. An increasingly complex and rapidly changing world requires graduates capable of both depth in a particular discipline, as well as intellectual breadth. Universities are challenged to bring their research, scholarship, analysis and especially education — in every field, natural science and engineering, social science, humanities, and arts — to bear on the challenge of creating a citizenry, a policy community and political system better able to join together to move toward a more sustainable future in a context that is inherently uncertain.

PANEL DISCUSSION ON HIGHER EDUCATION IN EUROPE

Moderator: Howard Newby

Participants: Berndt Huber, Jean-Marc Rapp, Fritz Schiesser and Georg Winckler

The original Maastricht Treaty gave no power to the European Union for higher education. There was little that could be done to integrate higher education in the E.U. without further organizational structures. There were early efforts to create an E.U. “higher education space”, such as the Erasmus program to encourage student mobility among institutions. But it took the shock of the weak performance of European universities in the rankings of global university rankings to stimulate a broader effort. The Bologna Process was launched in 1998 when the ministers of education from Germany, France, Italy and the United Kingdom issued the Sorbonne Declaration signaling their goal of achieving greater integration across European higher education.

A year later, 26 European ministers of education meeting in Bologna, Italy, followed up with a second, more inclusive communiqué spelling out their collective goal of increasing “the international competitiveness of the European system of higher education”. (This effort has now expanded to 47 nations, 27 being members of the E-U.) The goal was to promote student and academic staff mobility by establishing consistent degree programs and a European-wide quality assurance/enhancement system. Courses were assigned to various levels; learning outcomes were measured; and degrees were developed within a 3+2+3 year framework for baccalaureate, masters and doctorate degrees.

The early phase of the Bologna Process was led by government ministers who believed that since language defined the states served by the universities, they owned the universities and the process. However, progress has become increasingly dependent upon non-state actors such as the European University Association (EUA) and its student counterparts, the European Students’ Union (ESU) and the Council of Europe, which now drive the Bologna Process. The Bologna Process has evolved into a process explicitly linking six sets of key actors: ministers of education, university leaders, student leaders, leaders of international organizations, European Union bureaucrats, and policy think tanks that helped to define the issues and shape the agenda. But there remains very strong influence by the nation-states, in part because of the very limited mobility of students and faculties across the E.U. and vertically among institutions.

The ongoing dialogue established by the Bologna process has encouraged faculty to focus more on what students learn and the student experience. The development of quality control agencies and mechanisms has harmonized degree requirements so that degrees in the same field mean roughly the same thing across Europe. It has also prepared European nations for the different task of better differentiating among profiles and missions of universities in their effort to build institutions with world-class reputations.

There has been a similar effort to coordinate and intensify research activities across Europe through a European Research Council similar to the U.S. National Science Foundation. Yet, here there is a challenge, since so much of basic and applied research in Europe is conducted by non-university players (e.g., Max Planck Institutes, CERN). While there are moves to better position research universities in research policy development, this is still a struggle in many nations, such as Germany and France.

The EUA now includes over 800 universities (after the addition of Eastern Europe). A League of European Research Universities (LERU) was also founded consisting of 21 of the most research-intensive institutions. Both organizations are important components of the Bologna Process and the European Research Council and play key roles in shaping policy and lobbying for their agenda. They both see the current challenges as massification, demo-

graphics and mission profiling (e.g., the excellence agendas in Germany, France, and Spain).

SESSION 3: IMPLICATIONS FOR UNIVERSITY TEACHING AND LEARNING

Chair: Georg Winckler

Heather Munroe-Blum: Universities Serving As and Educating Global Citizens

Alain Beretz: Preparing the University and Its Graduates for the Unpredictable and Unknowable

Roberta Johnson: International STEM Education for Global Sustainability

Linda Katehi: Sustainability As Principle, Practice, Driver, and Culture

The “millennial” generation of students currently enrolling in universities is much more inclined toward social engagement than their predecessors as baby boomers or Generation X. Their positive attitude towards global challenges, coupled with their embrace of the revolution in technology and communications, are distinctive characteristics. How should universities adapt to educate today’s students as global citizens? Truly global citizenship requires of its people three important qualities: multicultural intelligence, empathy and courage. To what extent are universities educating and training people to understand and take effective action in relation to such imperatives?

In our globalized world, one of the most important roles of universities is forging international connections. Contemporary research and scholarly collaborations often demand a scale so massive, so daring, and requiring such a wide range of expertise, that it will increasingly be impossible for any single institution, organization or industry to assemble the necessary talent and infrastructure to tackle these on their own. This provides an unusual opportunity to launch more transnational research and connected research, along with education partnerships among nations and institutions.

Universities can engage with global issues more deeply by embracing research and knowledge translation on challenges that might not be receiving attention by other institutions or sectors. For example, to what extent are universities engaging with post-disaster reconstruction, nuclear risk, aging populations, international financial regulation or business ethics?

Entrepreneurship is in the university DNA, making of our institutions great places for attraction of talent with hunger to test new ideas. This includes the transfer and application of the knowledge and technology that flow from university research. But it does not stop there. It means, for professors and students, bringing the energy and expertise of universities to bear on problems that impact society: creating and evaluating a more effective biomedical device, sharing advice with policy-makers in societies transitioning to democracy, or helping

communities devise sustainable solutions to nutrition problems, and doing so via creative new approaches to teaching and learning. Social entrepreneurship has become an important theme with both local and global importance.

Here we face this double challenge: on the one hand, promote teaching that can transfer skills which correspond to an immediate demand of our society, while, on the other, the ability to face the unexpected and remain original and creative. Key here is the importance of research-based education in the construction of student skills. Research promotes in students a practice of positive criticism, adaptability, capacity to challenge, and a constructive experience of failure. Research-based education not only provides students with a learning method and technical know-how. It also provides an ethical framework, which is unique to the type of pedagogy developed in universities. These ethical principles are essential in the development of sustainable society.

The sustainability of humanity is determined by our ability to keep in balance the three pillars of society — our environment, and our economic and social systems. This broader concept of sustainability has evolved over several decades from the oil embargos of the 1970s, to the recognition of climate change in the 1980s, to the concern about political stability after the 9/11 terrorist attacks. Today, sustainability is more than a state of mind. It has evolved into a core value and strategy. It is principle, practice, driver and culture.

Sustainability has triggered a shift in thinking and reprioritization to acknowledge climate change and commit to sustainability as a practice, energy approach and commitment. Because of their commitment to service, many leading universities are embracing sustainability in their curricula, research efforts and policy studies.

Universities must act, and as they do so, they must break from the past. The traditional university approaches will not conquer the future. Behaviours and structures must change to fully embrace collaboration and multi-disciplinary solutions. The world's universities must be bold, creative, disciplined and frugal. It is possible. If universities work together as partners and collaborators, they will be the models, the living laboratories and the solution.

Yet, we face another formidable challenge. We cannot achieve global sustainability without widespread sustainability education. We need awareness on the part of the majority of the planet about sustainability. Education and global sustainability are a coupled set — one cannot achieve global sustainability without widespread sustainability education. Furthermore, education for sustainability must include STEM disciplines, as well as humanities and social sciences, and must be made available internationally, and where the bulk of the population is — namely at the primary and secondary levels — if we are to have any chance of making meaningful progress towards global sustainability.

Furthermore, because leading individuals towards sustainability involves a consideration of values, and the formation of values takes place mainly when

we are young, weaving consideration of values into education across disciplines in the primary and secondary level is an essential and too-long neglected component of education at these levels. Universities can play a major role in global sustainability by broadening their educational activities to include younger students. After all, students are likely to be the most essential element of achieving a sustainability education on sustainability issues, since they not only have the openness, the energy and the will to address these issues, but their future will be dependent upon their efforts.

SESSION 4: IMPLICATIONS FOR RESEARCH

Chair: Michel Benard

Timothy Killeen: Global Environmental Sustainability: An “All Hands On Deck” Research Imperative

Berndt Huber: Research Intensive Universities in a Globalized World

Georg Winckler: The Contribution of Research Universities in Solving the Great Challenges

Human activity is changing the climate system and the ecosystem services that support human life and livelihoods. The changes are occurring at an unprecedented and often bewildering pace. Solutions will need to address both the long-term *mitigation* of deleterious effects (through, for example, building a low carbon global economy) as well as near-term *adaptation* to changes already underway (through, for example, more effective conservation of freshwater stocks globally and creating greater levels of societal resiliency). Yet, detailed solutions are not always self-evident because of incomplete, contradictory and changing requirements that are hard to recognize until after solutions have been tried.

Furthermore, there is a mismatch in cadence between the evolution of the complex emerging sustainability challenges and our evolving state of readiness to respond — a mismatch that demands a new “call-to-arms” for the modern research university. Although it is possible to ponder global environmental sustainability questions from an academic standpoint at leisure and with a sense of distance and perspective, these changes are, in fact, occurring at rates that can and will simply overwhelm some of the traditional academic processes. It is critically important that research universities play their ordained role fully: aggressively educating and empowering the needed human capital to address these historic challenges, while also identifying and driving a vigorous research agenda that address the challenges of global sustainability in a timely and effective manner.

For example, the United States is currently stimulating universities to address these challenges at three levels: the Science, Engineering and Educa-

tion for Sustainability (SEES) program of the National Science Foundation; the Global Change Research Program (USGCRP), a 13-agency cross-cutting program of the federal government designed to further research in global change; and the Belmont Forum, established in the Fall of 2009 as a high level group of the world's major and emerging funders of global environmental change research and international science councils.

European universities also are heavily engaged in these issues. There has been considerable effort over the past decade to strengthen their research capability, providing them with more autonomy and less bureaucracy (e.g., ministers no longer appoint the faculty); harmonization of degrees and encouraging the mobility of students and faculty; encouraging distinct mission profiling and competition; and funding peer-reviewed research across throughout Europe through the European Research Council. While the funding of basic research lags behind applied research related to economic development, the E.U. research area is taking shape with leadership in many scientific areas.

Yet there remain many challenges. European universities continue to be too hierarchically organized, a fact that strongly hinders creativity and diminishes research opportunities for young scholars. While they continue to focus research on fundamental investigations, key to producing the knowledge that drives innovation, they must also compete with an array of non-academic research institutions (e.g., Max Planck, CERN, CEA) for funding and reputation, unlike the United States where most basic research occurs within research universities and is deeply integrated with graduate education.

Emerging technologies may overcome many of these constraints since they allow new forms of research collaboration. Massive digitization of printed materials (Google) and crowd sourcing (e.g., Wikipedia) are examples of tools that research universities are using to evolve toward an open system where information flows freely. Social computing is empowering and extending learning communities beyond the constraints of space and time. Open knowledge and education resources will clearly expand enormously the knowledge resources available to our institutions. Immersive environments will enable the mastery of not only simply conventional academic knowledge, but as well tacit knowledge, enabling our students to learn not only how “to know” and “to do”, but actually how “to be” — whether scholars, professionals, or leaders — but above all, contributing citizens of the emerging global community.

SESSION 5: ENGAGEMENT WITH THE WIDER COMMUNITY

Chair: Howard Newby

Rafael Rangel: University 2.0: The University as a Driving Force for the Economic, Political, and Social Development of Society

M. S. Ananth: Sustainability and IIT Madras

Maria H elena Nazar e: Regional Engagement and Sustainability: University of Aveiro in Portugal

Howard Newby: Sustaining World Class Universities: Who Pays and How?

John Niland: Globalization, Universities, and Sustainability Effects

Challenges such as global sustainability require universities to leave behind those paradigms that tend to limit their vision and function and move forward towards proactive schemes focused on society and its needs. The Tecnol gico de Monterrey System began in 1943 as Mexico’s MIT, but now its mission has broadened to become not only a “citizen oriented” university, but a world quality educational institution serving as a decisive change agent in Mexico. It is an excellent example of an evolving ecosystem for learning and engagement, based on the belief that a university must be embedded in the society it serves or it will fail.

The Tecnol gico de Monterrey System is a private institution, supported through fees, grants, and auxiliary activities involving extensive outreach to society through schools, economic development, and social incubators. It has embraced a new paradigm of University 2.0 in which the traditional activities of a university, education, research and extension, are reshaped with ethically focused intents and purposes to serve society through an immense array of new activities such as technology parks, business opportunity platforms, community learning and training centers, and research and education centers. It has cast aside the traditional tendency of universities to isolate themselves from society. Instead, through this new paradigm, it has accepted the obligation and the opportunity of reducing the social gap and preventing the disintegration of the structures that sustain humanity by means of deep-rooted, replicable solutions that aim to bring education and entrepreneurship to each and every citizen.

India provides an excellent example of how an emerging economy, now the second largest consumer market with the second largest pool of scientists and engineers in the world, balances economic development with environmental sustainability. Universities play a key role in both objectives, facing both the challenge of massification necessary to handle five times the current student population, and implementing new educational, research and outreach to address the impact of a rapidly growing economy on the environment. Ironically, although the university is recognized as the most traditional of all institution, it has of late become the major instrument of change in social, economic and political systems. Hence, it is natural to look for it to play a leadership role in sustainable development by adopting a new educational paradigm based on multidisciplinary education concerning environmental issues, stressing the values of equity, justice, and cultural and environmental sustainability, and viewing the learning process itself as lifelong and adapting to the needs of a changing world.

The E.U. faces a serious demographic challenge of quite a different nature with a projected loss of 42 million over the next 30 years. This constitutes the major threat to the sustainability of the European economy and the welfare state, undermines social cohesion and causes generational tensions. Social security costs, in terms of pensions and health care, will skyrocket and put an incredible tax burden on the working age group. At the same time, welcoming and integrating the immigrants needed to compensate for a declining population requires complex and expensive public policies, difficult to explain to the public at large in times of financial scarcity. This will require many research universities to develop a broader portfolio of academic programs, including more applied disciplines similar to those of the Fachschulen and polytechnic universities.

The global financial crisis has sharpened the sustainability challenge for research universities in enduring ways: unprecedented funding difficulties will cause many to really struggle to maintain the core values, priorities and contributions of the research university. Sustainability will often depend on finding new horizons, both financially and geographically. More and more university budgets will draw from the private purse of international enrolments and local students alike, reflecting a new era of government incapacity to fund universities at prior levels. A distinctive development will be the international migration of universities themselves through more substantive branch campuses, both for profile building and to tap into revenue opportunities.

There is likely to be an intensification of the role of government, even in those countries where public funding is in serious decline, such as the U.S. and the U.K. Here, public policy will set ground rules affecting sustainability for the research university, to provide: how students, both local and international, will shoulder the greater proportion of operating costs; how debt issuance will be regulated, and what underwriting will be extended, either formal or implied, to protect the national higher education sector's international brand. Paradoxically, the stronger the role of the private purse, particularly where foreign currency is involved, the more government regulation and oversight can be expected.

During the past decade a remarkable paradigm shift has occurred in the relationship between universities and governments. It was once the role of governments to provide for the purposes of universities, but it is now the role of universities to provide for the purposes of government. As costs have risen and priorities for tax revenues have shifted to accommodate aging populations, governments have asked more and more stridently, what are universities for? The imperatives of a knowledge-driven global economy have provided a highly utilitarian answer: to provide the education workforces and innovation necessary for economic competitiveness. Governments, in other words, increasingly regard universities as delivery agencies for public policy goals.

This creates a range of implications for university governance. Clearly, the style and mix of university governance bodies are changing. Student debt burdens are rising with serious political implications. New stakeholders are challenging university autonomy and academic freedom. And the dynamics of the interaction between governing boards and the university administration are becoming increasingly difficult. These may be the bedrock of sustainability issues for the modern research university.

SESSION 6: SUMMARY AND CONCLUSION

Chairs: James Duderstadt and Luc Weber

The open discussion began with a renewed expression of concern about the serious public and political misunderstanding of compressed timescales characterizing many sustainability challenges. Even though many recognize the issues at stake, they believe that there is time to work it out — perhaps over decades, perhaps over one or more generations. However, we now have a historically unique and pivotally important race on our hands: a race between the development, dissemination and application of the knowledge needed to create a sustainable future and an opponent: the deleterious and disruptive changes, now well under way, that might/will sap our ability to respond in the future. This race is such a tight one, with the two horses running neck and neck together at this moment in history (in fact — an even more humbling thought — during our professional careers!) In an ideal world, after all, the required knowledge base could have been available and well-accepted a century or two ago. And, in a non-ideal world, we would never have had an inkling of what hit us.

Because of the need to win this race and because of their unique ability to educate and mobilize the world's brain trust across the full range of disciplines, research universities have the following urgent and specific responsibilities:

1. To *transform* education — and not just post-secondary, but the full spectrum of formal and informal education — to educate, engage, empower and energize the next generation of problem-solvers;
2. To *drive* a robust international and collaborative research agenda designed to identify, invent, test and deploy solutions designed to address the formidable challenges of global sustainability;
3. To *insist* on building both disciplinary depth and trans-disciplinary breadth of research and education, connecting science, engineering, technology, mathematics, social sciences, arts and humanities disciplines in service to society;
4. To *assess* the need for societal action, to transmit authoritative information to stakeholders and then *take ownership* of the process of transition of knowledge to application, working in new partnerships.

Research universities must respond and respond quickly to these onrushing, complex, and multifaceted sustainability questions that demand science and technology analyses, coupled with deep understanding of human decision-making processes under conditions of large — and sometimes poorly defined — uncertainty. These challenges will undoubtedly stress research universities in ways that are quite unusual and it is likely that many institutions will simply fail to be relevant to the times. Those that do step up, however, will play an historical role for the future of human well-being.

Who sets the agenda for universities? To what degree does sustainability depend on the relationship with the state? And what about these challenges to the sustainability of the research university itself, at least as we currently understand it? In fact, in order to prepare for the unpredictable, the university needs to be itself a sustainable structure. It cannot change its policies or priorities to answer to short-term requirements of governments or economical stakeholders. Long-term sustainability is an absolute requirement if we want to be able to respond quickly to the unpredictable; it implies that universities are granted enough autonomy, both on the academic and financial aspects.

A decade ago, the Glion Colloquium met to consider emerging challenges for the world's research universities. These were seen as essentially *positive* forces for change, and included the digital revolution, shifting forms of competition, collaborative research, and the new energy in “town and gown” relations. Since then, the mood has darkened somewhat. Alarms over the future of the modern research university are numerous. An abiding theme is the dangerous world in which universities now find themselves, although the diagnosed fault lines vary from the intrusion of corporate values to the argument higher education must be rigorously regulated and completely restructured. Whatever the merits of either extreme, they serve to underscore a rising unease about the very sustainability of research universities, at least in their modern form.

Hence, perhaps it is appropriate to conclude this summary of the VIII Glion Colloquium with a quote from the first Glion Declaration, drafted a decade ago by Frank Rhodes at the dawn of the new millennium:

“For a thousand years, the university has benefited our civilization as a learning community where both the young and the experienced could acquire not only knowledge and skills, but the values and discipline of the educated mind. It has defended and propagated our cultural and intellectual heritage, while challenging our norms and beliefs. It has produced the leaders of our governments, commerce and professions. It has both created and applied new knowledge to serve our society. And it has done so while preserving those values and principles so essential to academic learning: the freedom of inquiry, an openness to new ideas, a commitment to rigorous study, and a love of learning. There seems little doubt that these roles will continue to be

needed by our civilization. There is little doubt as well that the university, in some form, will be needed to provide them. The university of the twenty-first century may be as different from today's institutions as the research university is from the colonial college. But its form and its continued evolution will be a consequence of transformations necessary to provide its ancient values and contributions to a changing world" (Rhodes, 1999).