



PROMOTING LEADERSHIP IN THOUGHT  
THAT LEADS TO ACTION

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## Freedom and Unity

America was founded by immigrants from many nations of diverse political ideals, disparate religious beliefs, social backgrounds (French aristocrats, Irish serfs, Chinese coolies), different races (white, black, oriental), and a multitude of linguistic groups. They shared only one thing in common that bound them to one another – a common quest for liberty, a love of freedom.

They discovered that freedom in the New World in a measure never before imagined or realized elsewhere: *political freedom* to speak whatever they chose and elect their own leaders at a time when monarchy still reigned supreme in Europe, the right to vote was confined to three percent of Englishman, and candidates for Parliament came almost exclusively from the upper class; *religious freedom* to believe, speak and worship according to their own dispositions – be they Puritan, Quaker, Anabaptist, Mennonite, Jesuit, Anglican, Lutheran, Huguenot, Catholic, Jewish, Calvinist, Methodist, or a host of others; *economic freedom* where anyone could become anything and rise from rags to riches within a lifetime, where huge chunks of land were given almost free for the asking, where wages rose to ten times the level prevalent in Europe due to the perennial shortage of workers; *social freedom* from class discrimination, where an impoverished boy born in a log-cabin and self-educated could rise to become the President of the country at a time when the European society was still dominated by an aristocracy and landed gentry that occupied all senior positions in government, church, military and universities; and *cultural freedom* from discrimination based on birth and lineage that still marked an English or Frenchman according to his family of origin and his linguistic accent.

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*“Abraham Lincoln believed in the sanctity of these two apparently contradictory and irreconcilable goals – freedom for all and unity for the nation – and was willing to risk all and sacrifice everything else for the sake of realizing them.”*

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So great was the freedom in America that a visiting French prison administrator, Alexis de Tocqueville, wrote his famous book *Democracy in America* in 1832 marveling at what to Europeans was unimaginable, and a century later his fellow countryman Charles de Gaulle (not known for his excessive love of America) was compelled to proclaim the same while walking the streets of New York. Freedom and freedom alone united these diverse people and molded them into a nation that multiplied rapidly in numbers and expanded rapidly in space until they reached across the continent to the Pacific Ocean.

Yet, it was also the issue of freedom that divided America and Americans from the country’s very inception, when slave-owning southern plantation owners refused to join the newly established United States of America without assurances that their black slaves would be regarded under law as personal property, rather than as human beings. Jefferson’s famous declaration that ‘All men are created equal’ was modified in practice to mean all white men – not blacks who were merely property, not even white women, who did not attain the right to vote till 135 years after the Declaration of Independence. Many of those who

had fled to America in quest of liberty were unwilling to extend the same gift to others, if they could benefit from depriving others of the same privileges they enjoyed. The Southern economy rose and prospered for a time on the strength of slave labor, as wealthy monarchs and emperors had ruled elsewhere in the past on the strength of the sacrifices of their people.

The dispute over freedom was a slim crack in the original constitution of the country which gradually widened into a fissure and broadened into a chasm that threatened and nearly succeeded in destroying the confederation of states and splitting it asunder. The American Civil War – the first modern war and bloodiest ever fought until that time – began in 1861 to determine whether that fracture would become a permanent division of the nation into two or more independent countries or whether the original flaw in the union of former colonies would be permanently eliminated. The war was won and political freedom granted to the slaves due to the leadership of a remarkable man and great leader, Abraham Lincoln, who ardently believed in the sanctity of these two apparently contradictory and irreconcilable goals – freedom for all and unity for the nation – and was willing to risk all and sacrifice everything else for the sake of realizing them.

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*“Freedom remains an empty promise unless it encompasses not only the right to vote, speak and worship, but also assures the right to work, to a steady income and economic security, to social acceptance and mental development.”*

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The outcome of the war ruled for Freedom and Unity. Slavery was abolished from the continental USA, as it had already been abolished throughout Europe. The loosely bound confederation of states was forged into a tightly knit federation with a strong federal government empowered to ensure freedom for all Americans. In the following decades America fulfilled its manifest destiny of incorporating all the territories between the Atlantic and the Pacific. It enjoyed the most rapid economic growth in its history and of any nation up until that time. Before the end of the 19<sup>th</sup> century, it had become the most prosperous nation in the world.

Yet the quest for real freedom had only been won in principle, not in fact. For freedom remains an empty promise unless it encompasses not only the right to vote, speak and worship, but also assures the right to work, to a steady income and economic security, to social acceptance and mental development. Political freedom is the foundation on which economic, social and psychological freedom are to be attained and assured. The rapid spread of higher education widened economic opportunities for many Americans, but for long the blacks were virtually excluded from access to the best schools and higher institutions of learning. Having attained in principle equality before law, they were still oppressed by social and economic discrimination. It took another 100 years or more to translate the promise of political freedom for the blacks into a modicum of social and economic equality. That struggle is still playing itself out today.

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*“Political, economic and social freedom have become fertile soil in America for the eventual emergence of psychological freedom – the freedom to be oneself and realize one’s unique potential as a human being.”*

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In the 21<sup>st</sup> century, Americans enjoy greater freedom than the people of any nation in history – freedom to think and speak what they wish, worship whatever they please and be whatever their individual propensities urge them to be. More than its wealth or its power, it is that freedom which makes America so deeply appealing and attractive to people all over the world. As an 18 year old Indian woman exclaimed after working in the USA for a year, “for the first time in my life I am treated as though my ideas and opinions matter, that I have capacities to be developed and aspirations worthy of being fulfilled.” Political, economic and social freedom have become fertile soil in America for the eventual emergence of psychological freedom – the freedom to be oneself and realize one’s unique potential as a human being.

The combination of Freedom and Unity in America became a source of inspiration for other nations, for the nationalist movements that ended colonialism in 50 countries after the Second World War, for the founding of the UN as a united community of nations, and the birth of the European Union. Had it not been for the Northern victory in the Civil War, history would have been dramatically different. America would not be and would never have become the world’s most powerful and prosperous nation, the leader of the free world, the embodiment of the human aspiration for freedom. Far more likely, it would have splintered into a dozen or more independent nations and labored over decades to overcome their differences to reunite as the countries of Europe are laboring today. Yet, Freedom remains an unfulfilled idea in America, a distant goal, perhaps even a fading dream. And the reason is still the same. Those who enjoy the benefits won at such great cost and sacrifice by their forefathers seek to preserve their privileged positions and are reluctant to extend and share what they have gained with others. Freedom to them, like to the slave-owning plantation owners of an earlier period, means freedom for themselves, not assured equality for all.

*“Speculation  
is financial  
slavery.”*

Today, the divide that separates people is economic rather than political – the rights of those who possess wealth opposed to the rights of those who aspire for it and are deprived by a plutocratic political system, by an economy dominated by major corporations and money power, and by the right of financiers to speculate, even when it endangers or destroys the real economy which it is intended to support and deprives millions of their capacity to earn and achieve economic security. Speculation is proclaimed as their sacred right while the right to gainful employment is left unrecognized. Speculation is financial slavery. President Franklin Roosevelt understood the divisive power of economic inequality and strove to combat it by launching the New Deal. He understood that economic equality makes real political freedom.

FDR even planned after the war to introduce a second Bill of Rights to protect employment and other economic rights, but died before he could achieve it. The right to employment is the economic equivalent of the right to vote in democracy. Without access to gainful employment opportunities, freedom is a maimed concept.

The battle won at Gettysburg effectively ended the Civil War, reunited all Americans within a single nation, freed black Africans from slavery and deprivation of their legal rights, and made the USA far stronger than it had been. But the war for Freedom and Unity was not won that day. It continues to be waged on a battlefield that now encompasses the whole globe.

Nearly three decades ago another great leader rose inspired by the values of Freedom and Unity. He too risked all to win freedom not only for his own people, but also for the people of many other countries living behind the Iron Curtain and beyond that for humanity as a whole, which was bound and oppressed by the ever-looming threat of total catastrophic war between the superpowers. Mikhail Gorbachev won a huge battle for freedom on behalf of all humanity. Because of his initiatives, a democratic revolution spread throughout Eastern Europe and overflowed to other continents. The world became a far safer, more open, freer place where people could move freely and interact without fear or suspicion. The very founding of the World Wide Web was made possible by Gorbachev's radical initiatives, making possible the extension of freedom globally.

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*"Every forward step of human progress over the past five centuries has been a step toward greater freedom and greater human unity."*

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Still, the war is not over. Political battles are still being waged in many countries. Economic inequality is rising. Plutocracy is even more entrenched than ever before. The unequal sharing of resources threatens the stability of the earth's environment. The whole world is held ransom by the manipulations of financial speculators and the political power of vested interests.

The war is not over, but its inevitable future direction and result are assured beyond doubt. Every forward step of human progress over the past five centuries has been a step toward greater freedom and greater human unity. They are the engines that have unleashed the creative energies of humanity and channeled them through social organization into greater material, social and psychological security, welfare and well-being. The signposts for humanity's future evolutionary progress are unmistakable. Our future lies that way. Every small forward step carries us closer to the goal and our common human destiny.

**Garry Jacobs**

## Reflections on the Future of Global Higher Education WAAS Conference Report

Heitor Gurgulino de Souza\*, Janani Harish†, Garry Jacobs‡,  
Winston Nagan§, Ivo Šlaus¶, Alberto Zucconi\*\*

### Abstract

*Education is the most important catalyst of social evolution. Today higher education is in the early stages of a revolutionary transition that will have immense impact on the future of global society. This article presents an overview of perspectives explored at the World Academy's Forum on Global Higher Education conducted at the University of California at Berkeley on October 2-3, 2013. It examines issues resulting from rapid changes in educational technology and organization that impact on accessibility, affordability, quality, relevance, employability and content of higher education. It envisions establishment of a World University Consortium as a network and umbrella group to facilitate educational partnerships and linkages with other interested stakeholders at the international level, to provide a centralized source of information about latest innovative ideas and developments in this field, and to explore creative solutions to enhance the reach, quality and relevance of higher education globally.*

There are defining moments when the long, slow crawl of history leaps into the future. The Reformation, French Revolution, and birth of the Internet are instances. Such a moment has come for higher education. No one can predict with confidence what the future of higher education will bring, but it is certain to be very different from what we have known in recent centuries. Education is in the early stages of breaking the boundaries imposed by the physical classroom, the monastic insulation of the college campus, the arbitrary rigidities of degrees, courses and one hour lecture segments, the social barriers of class divisions and the economic barriers of affordability. Misinformation, misconceptions and myths abound, but beneath all the hype, there are real forces at work and real changes in the offing.

The World Academy's Forum on Global Higher Education was conducted to examine recent developments at the epicenter of educational innovation in Silicon Valley and to explore their potential implications for the world-at-large. The conference brought together leading educators from six continents to interact with faculty from UC Berkeley, Davis, Irvine, UCLA, Stanford, San Jose State, Carnegie Mellon, Duke, Phoenix, Florida, UNLV, San Diego State, Humboldt State, Brandman, Meridian, Berkeley City College, Mt. San

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Jacinto College, Ohlone College and Sofia University. They met with representatives from the Western Association of Schools and Colleges, International Association of University Presidents, Creative Commons, Policy Sciences Center, Tony Bates Associates, Center for Partnership Studies, Spire Education, InterEnvironment Institute, Center for Digital Education and Net Impact, diplomats from Colombia, India, Mongolia and Venezuela, and companies pioneering new technologies and services in the field of education, such as Google, Pearson, Fujitsu, 2U.com, uncollege.org, Knewton, StudyRoom, Talent2 Education and Accredible.

The Academy's emphasis on global higher education is a natural and inevitable product of its endeavor to frame a new human-centered paradigm for global development. Efforts to address the pressing global challenges related to the financial crisis, rising levels of unemployment, poverty, ecological imbalances, international security, democratization, global governance and rule of law all depend on raising the level of education and understanding of people around the world. Without enhancing the quality of human understanding, knowledge and skills, these problems will continue to defy solution.

## **1. Global Needs Assessment**

There was a consensus among conference participants that significant changes are needed in the global system of higher education in order to meet the diverse needs of humanity. In his inaugural remarks, UC Berkeley Executive Vice Chancellor George Breslauer described the growing pressures on his institution to cope with stresses resulting from the very rapid pace of technological change, rising costs and globalization. While local conditions naturally vary, there was a broad agreement on seven priority objectives: expanding accessibility to make quality higher education available to a much larger proportion of the population in both economically advanced and developing countries; raising completion rates of students who enroll in college; bringing down the cost of education, which is an increasing burden to students everywhere; improving relevance to eliminate the mismatch between the knowledge imparted and the skills required by the labor force to achieve full employment; enhancing quality of education; applying innovative technologies for delivering content, interaction with students, evaluation, assessment and accreditation; and reformulating the content of courses and curriculum to more effectively address social needs.

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*“A Chinese farmer would have to work for 13.6 years in order to fund tuition at a Chinese university, while those who live in wealthier urban areas pay the equivalent of 4.2 years of an individual's annual income on average.”*

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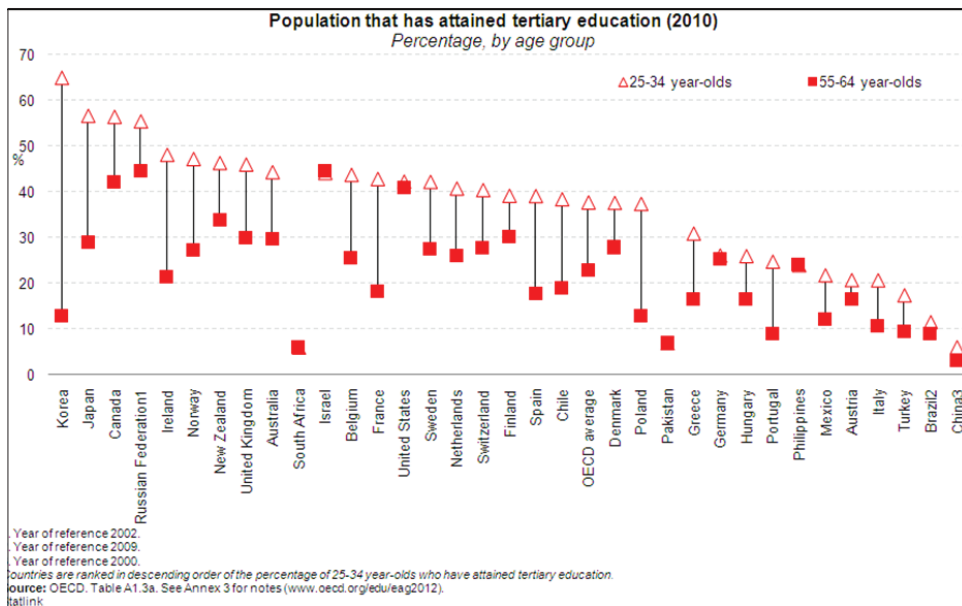
Globally, levels of education are rising about 2% faster than GDP growth. The rapid expansion of the international Middle Class is generating increasing pressure for expansion of capacity in higher education. Figure 1 shows the percentage of the population in the age groups of 25-34 and 55-64 that has completed a college degree course in different countries.



Korea leads the world with 65% of 25-34 year olds obtaining a bachelor’s degree or higher qualification compared with about the 40% average in OECD countries. Comparison of this age group with the 55-64 year old group reflects the rapid growth of higher education in recent decades.

An increasingly educated workforce is essential for responding to the growing complexity and sophistication of modern society and work. Globally, those with a college degree achieve higher rates of employment and earn significantly more than those with lower levels of qualification. According to a study by the Hamilton Project, an economic policy initiative at the Brookings Institution, those who graduate from a four-year college in the USA, on average, earn \$20,000 more a year than those with only a high school diploma, as a result of the degree.<sup>1</sup> In spite of the clear economic advantage of higher education, the percentage of adults with at least a bachelor’s degree ranges from a high of 45% in Norway to a low of less than 10% in many poorer developing countries as shown in Figure 1. In its report *A New Dynamic: Private Higher Education*, UNESCO estimates that the global system for higher education will need to expand its capacity to accommodate over 262 million students by 2025, up from 97 million in 2000.<sup>2</sup>

**Figure 1: Percentage of the Population with Tertiary Education in Select Countries, 2010<sup>3</sup>**



Affordability is closely related to accessibility, for the wealthy are never denied educational opportunity. Even in education-rich America, John Mitchell, Vice Provost of OLI at Stanford, pointed out that large numbers of qualified, economically disadvantaged students are being denied education due to the limited capacity of public systems. In Brazil an esti-



mated 4.5 million aspiring students will be denied higher education this year. Increasing accessibility is essential in all countries. A combination of rising costs, lower levels of economic growth and higher government budget deficits is forcing many universities in the USA to raise tuitions and reduce financial aid to the needy. Since 2000, the average tuitions and fees at public four-year institutions in the USA have risen by 72%, while the average earnings of full time workers aged 25-34 who only have a bachelor's degree has declined by 14.7%. Student debt has topped \$1 trillion and is now the single largest category of private American household debt. The situation in developing countries such as India is even more precarious, as most of the expansion in higher education has been in private, for-profit institutions charging exorbitant admission fees beyond the reach of even Middle Class applicants. A survey conducted by the Associated Chambers of Commerce and Industry of India, ASSOCHAM, revealed that Indian parents invest an average 75% of their income in their children's education.<sup>4</sup> According to a Xinhua News report, a Chinese farmer would have to work for 13.6 years in order to fund tuition at a Chinese university, while those who live in wealthier urban areas pay the equivalent of 4.2 years of an individual's annual income on average.<sup>5</sup> Each year of higher education costs 6 to 15 months' labor for a rural parent in China.<sup>6</sup>

**Table 1: Education Cost Affordability Rankings in Select Countries, 2010<sup>7</sup>**

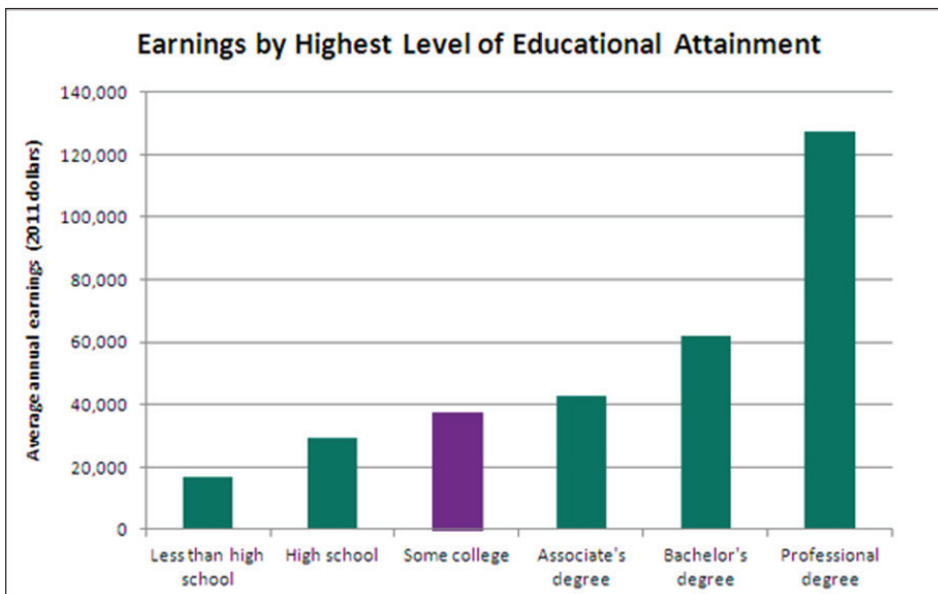
Country	Education Cost	Median Income	%	Rank
Australia	\$7,692	\$23,017	33.42%	12
Canada	\$5,974	\$26,623	22.44%	10
Denmark	\$530	\$22,929	2.31%	2
England & Wales	\$1,243	\$24,652	21.45%	9
Finland	\$5,288	\$21,010	5.92%	6
France	\$585	\$20,660	2.83%	3
Germany	\$933	\$22,020	4.24%	5
Japan	\$11,865	\$22,790	52.06%	14
Latvia	\$3,299	\$13,646	24.17%	11
Mexico	\$5,077	\$4,615	110.01%	15
Netherlands	\$3,125	\$28,032	11.15%	7
Norway	\$596	\$26,623	2.24%	1
New Zealand	\$3,118	\$19,265	16.18%	8
Sweden	\$600	\$20,716	2.89%	4
USA	\$13,856	\$26,990	51.34%	13

Table 1 compares the total cost of completing a four-year degree, including tuition fees, textbooks and study materials, in various countries with median national income. It shows the average cost of education which ranges from a low of 2.2% of median income in Norway to a high of 110% in Mexico.

Rising levels of unemployment severely aggravate the education challenge. Youth unemployment levels are double the national unemployment average in most countries, ranging from 35% in Italy and 38% in Portugal to more than 50% in Greece, Macedonia, Serbia, Spain and South Africa.<sup>8,9</sup> While college graduates continue to earn significantly more than those who lack a degree, fewer graduates are finding a college degree an assured passport for remunerative employment.

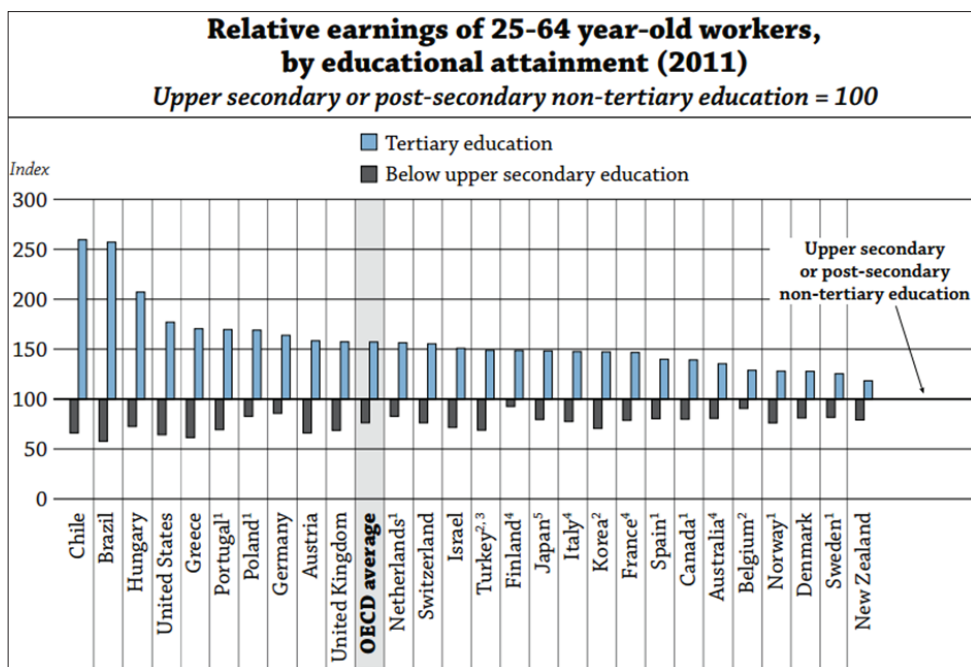
The correlation between level of education and level of income is clearly evident. More education clearly pays. In 2009 college graduates in USA recorded employment rates 18% higher and income levels 22% higher on average than high school graduates.<sup>10</sup> Figure 2 shows the earnings by level of educational attainment in USA.<sup>11</sup> The average annual earnings for a high school graduate in the US is \$30,000, whereas for a degree holder, it is over \$60,000, and for a professional degree holder, over \$120,000. In OECD countries, on average, the relative earnings of those with a tertiary education is over 1.5 times that of those with lower levels of education. In Brazil, Chile and Hungary, it is more than twice the earnings of adults with lower levels of education.<sup>12</sup>

**Figure 2: Earnings by Highest Level of Educational Attainment in USA (2008-12)<sup>13</sup>**



At the same time, employers are increasingly critical of the failure of conventional degree programs to impart the knowledge and skills students require for successful careers. A new US survey of American entrepreneurs cited by *The Economist* reconfirms the complaint that companies cannot hire the right people because universities are failing to keep pace with a fast-changing job market.<sup>14</sup> Among the many noted deficiencies is the failure of higher education to equip students with the skills needed for working in teams, thinking for themselves, understanding other people and being creative.

Figure 3: Relative Earnings of Workers by Educational Attainment in Select Countries, 2011<sup>15</sup>



Quality education is still a luxury enjoyed by a few. In evaluating the quality of new educational delivery systems, there is a tendency to exaggerate the quality of traditional institutions of higher education, ignoring the fact that even in the finest institutions, the quality of instruction varies widely. Between the best and average differences in quality can be enormous, and even greater between the average and the lowest level of institutions. In developing countries, many institutions are very poorly equipped, faculties are under-qualified, student-teacher ratios are far too high, and many teaching positions remain vacant. In India the vacancy rate among public institutions is about 40%. One need only try to recall the number of truly inspiring instructors encountered during four years to realize how rare top quality education truly is. But the importance of quality is not diminished by its scarcity. Enhancing quality is as important and as great a challenge as expanding the system quantitatively.

A global needs assessment must also highlight the need for revolutionary changes in the content of what is being taught. In a world of increasing complexity and speed of change, the knowledge imparted by overly-specialized courses of study is grossly inadequate to equip students to understand the world they live in, adjust and adapt to change, earn a decent livelihood and contribute meaningfully to the development of society. The declining emphasis on the liberal arts is aggravating the problem. Interdisciplinarity, multidisciplinary, transdisciplinary are vital for providing students with intersectorial, integrated perspectives. There is ample and mounting scientific evidence that our relationship with ourselves, others and the planet we live in is the main variable influencing all the aspects of our lives. We need to see, think and act systemically. Economy is inextricably interlinked with technology, politics, law, society, management, psychology and the environment. Medical practice today requires an increasing knowledge of technology, sociology, psychology and ecology. Law is an artificial abstraction when divorced from an understanding of political and social processes. Vocational skills are inadequate unless accompanied by an understanding of other people, the capacity to work in groups, a knowledge of technology and its impact on human health. In an increasingly globalized world, citizenship necessitates an understanding of other nations, languages, cultures and historical periods.

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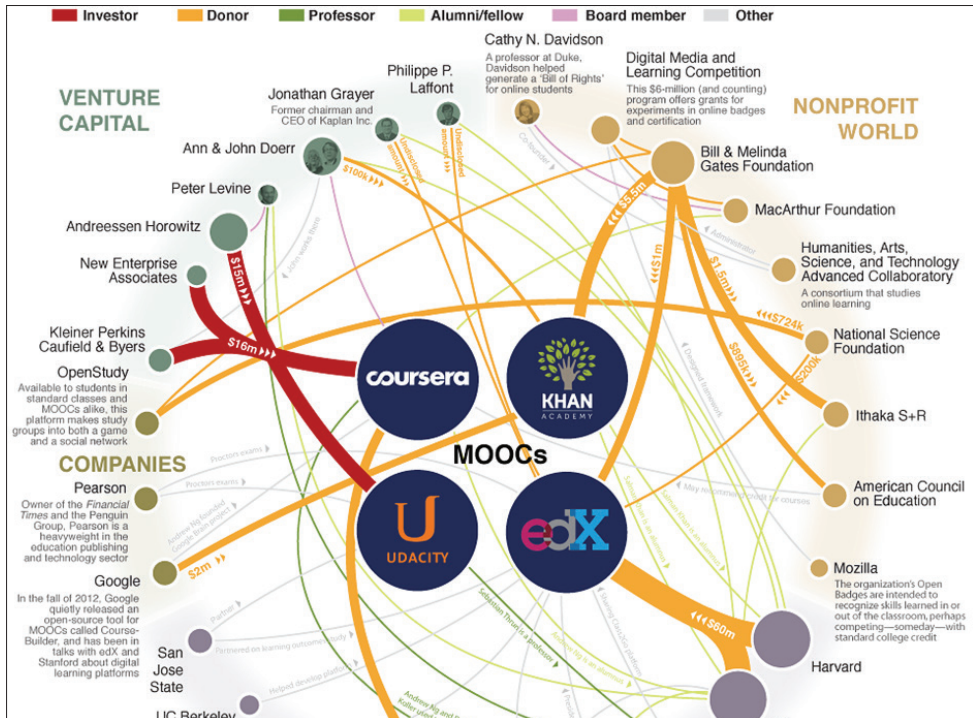
## **2. Is there Life beyond the MOOCs?**

Can Online Education (OLE) successfully address the need to expand global capacity in higher education? Distance learning in one form or another has been around since the 1950s. Bob Horn was part of the first institute for educational technology established at Columbia University in the 1960s working on the first authoring system for computer-based instruction in collaboration with IBM. There is nothing especially new about online courses except the wildfire speed with which MOOCs or Massive Open Online Courses are spreading. UC Irvine launched open courseware in 2000 and now offers 90 courses online, including the entire undergraduate chemistry curriculum. Carnegie Mellon created its first web-based, free courseware offering in 2002. MIT uploaded their undergraduate courseware to the web a decade ago. UC Berkeley introduced its first online course with physical exams in 2007. Between 2004 and 2012, Oakland University in Michigan launched 20 online degree programs in the humanities and health sciences.

The past 18 months have witnessed an explosion of open, online courseware in American higher education, prompting the *New York Times* to proclaim 2012 the “year of the MOOC”. Founded by Harvard and MIT in December 2011, edX now includes more than 20 partner universities offering 77 courses and more than a million students. Founded by Stanford professor Sebastian Thrun three months later, Udacity is already offering 25 courses to more than 400,000 students. And even more impressive, the youngest of the three, Coursera, now includes instructors from 73 universities, more than 440 courses and 4.7 million stu-

dents in 196 countries.<sup>16</sup> Universities such as UC Berkeley are experimenting with multiple approaches including public MOOCs, online for credit and certificate courses, and self-financing professional Master’s Degree programs in fields such as public health and computer science. San Jose State, the oldest public university in California, already has more than 7000 students enrolled in about 100 online courses.

Figure 4: Major players in the MOOC Universe<sup>17</sup>



One result of the explosion of MOOCs has been to break down the traditional boundaries separating institutions of higher learning. Today many institutions are sharing their technologies, course content, students and even faculty with other institutions in the same country as well as with students and institutions in other countries. Education is going global.

There has been a vigorous debate as to whether the high dropout rate experienced by MOOCs is the result of a design failure or a failure to filter out underqualified, uncommitted students. Gary Matkins, Dean, Continuing Education and Distance Learning at UC Irvine, thinks that MOOCs are being criticized for what they are not rather than being judged for what they actually are. The preoccupation with course completion rates has obscured more important qualitative issues – such as learning and retention rates among serious learners.

The sudden rise of the MOOCs has raised fundamental questions about the essential ingredients for effective education. Jorge Klor de Alva, former President of the University of

Phoenix, identified essential elements for a global educational model, including scalability, centralized aggregation of curriculum, structured scheduling, quality assurance, accreditation, financial viability and regulatory challenges posed by local and national authorities. It remains unclear how and to what extent MOOCs will be able to successfully address these and related issues.

Can online video lectures really equal or replace live contact with instructors in the classroom? The consensus of conference participants is that it cannot, but that MOOCs can play an important role as a complementary or supplementary tool for content delivery. UC Berkeley, Irvine, Stanford and many others are now experimenting with hybrid, flipped classroom models in which a significant portion of content delivery takes place online outside the classroom, leaving faculty more time to interact directly with students. MOOCs have proven an excellent medium for beta-testing new learning content and techniques. Philip Stark, head of Statistics at Berkeley, found that automated online testing freed up graduate student instructors to spend time working with students on problem solving and solution design. Armando Fox, Faculty Director, Berkeley Resource Center for Online Education, utilizes a hybrid system he calls SPOC (Small Private, Open Courseware), making it possible to expand class size from 40 to 100 students, while achieving better outcomes than through traditional classroom teaching. Candace Thille reported results from hybrid courses at Carnegie Mellon in which learning time was abridged from 16 weeks to 8 weeks and four classes to two classes a week, with better learning outcomes.

Khosrow Ghadiri at San Jose State utilized an online circuits and electronics course on edX, as part of a hybrid model. At home, students watched the online lecture, then filled out a survey designed to gauge which parts they understood and which gave them trouble. Ghadiri spent the first part of each class reviewing the most problematic topics. Then he broke students into small groups to work on solving problems together, and quizzed them individually on each day's material. At the end of the semester, 91% passed the course—a huge improvement over the 65% average pass rate over the past seven years. Georgetown University found it was able to expand its Master's Degree program in Public Health 20-fold and achieve better outcomes by taking it online, and its online nursing program was so successful that it cancelled the off-line program.

The evidence suggests that while MOOCs by themselves may not equal the quality of learning experience provided by classroom training in many universities, they can make the best quality course content accessible globally, including in places where a shortage of qualified teachers and textbooks deprives many students of access to reliable knowledge. What could be the impact on quality of higher education, if the world's most informed, inspiring and skilled communicators could be made available to students everywhere, anytime and in any language?

MOOCs in some form and combination with personalized interaction offer considerable promise as a solution for expanding accessibility and overcoming the critical shortage and high cost of faculty. Catheryn Cheal, San Jose State University Academic Technology Associate Vice-President, reports online instruction combined with online proctoring of exams enables a single instructor to serve 700 students for statistics courses, 14 times the 50 stu-



dents manageable by traditional classroom methods. For psychology, the comparable figure is 400 students. In future groups of campuses could be pooling their courses to widen the range available to students everywhere.

Fabian Banga of Berkeley City College calls for a much broader conception of open educational resources that incorporates the full power of network connections between faculty and students and peer to peer among students. He is experimenting with innovative learning platforms and other enormously powerful technologies for interconnectedness, including Google hangout, YouTube, and Twitter.

The California Community College System, which covers 2.4 million students enrolled in 112 campuses, is the largest system of higher education in America. Mike Orkin, Vice Chancellor of Educational Services at Peralta Community College District, described how the State of California plans to link all these institutions together so that students enrolled in any campus can have access to thousands of online courses offered by other colleges in the system. This is only one example of a trend that could eventually lead to development of a world university network.

### **3. From Teaching to Learning**

Regardless of the ultimate fate of the MOOCs, their dramatic arrival is likely to have a lasting impact on higher education. A profound shift is occurring in ideas about what higher education is all about. The ability of a teacher to deliver classroom lecture content to hundreds, thousands or even hundreds of thousands of students simultaneously raises more fundamental questions about the true nature of education and the true role of faculty in delivering it. In an age of ubiquitous information and YouTube-like streaming video systems, is content delivery the sole or primary role of instructors? Or is there something more to teaching? The transmission of specific knowledge content is no longer viewed as the sole or predominant goal. The emphasis is shifting from knowledge content to pedagogy, from teaching to learning. According to Mark Fink, Vice Provost at UNLV, the role of faculty is shifting to facilitating learning, which is what it should have been all along.

Exposed since birth to the intensities of a digital, interconnected, interactive world, the younger generation wants a more active type of learning experience. Mohammad Qayoumi, President of San Jose State University, calls for the creation of a new eco learning system that utilizes technology as a weapon for mass instruction. Situated in the heart of Silicon Valley, he insists that rapid innovation is as important for educational institutions as it is for business success.

The advent of Open Learning Initiative (OLI) systems has revived age-old debates regarding teaching and learning and spurred studies to try to understand more about how different types of students learn different types of subjects. Few, if any, of the conference participants believe that OLI can completely replace human interaction between students and instructors. But most would agree that OLI is shifting the emphasis from content delivery to how best to promote active learning by students, marking a change in emphasis from Learning Management Systems to Adaptive Learning Systems.



#### 4. Changing Roles of Faculty and Students

Recent developments in OLI have raised many questions regarding the role of the instructor in higher education. No longer is the instructor adequately described as one who has already acquired knowledge. Instruction implies also the capacity to transmit it effectively to others. This in turn requires a knowledge of the learning process and how to facilitate it. Furthermore, the conversion of live lectures into OLI requires several sets of skills that few faculty members now possess.

The rapid growth of the MOOCs has only been made possible because they have broken up the task of course development into numerous roles, each performed by a specialist. Faculty provide the content. Learning architects trained in structural design create workflow process models to improve learning speed and retention rates. Content developers reorganize the content into smaller segments of knowledge, typically 10-15 minutes in length, combined with short quizzes and interactive exercises. Trained actors are often utilized to film lecture segments. Udacity is experimenting with the use of mentors available 24 hours to monitor student learning activity, help them acquire skills in self-learning, motivate them to work on their own and promote interaction with other students.

One of the challenges is to devise the right mix of incentives to overcome the indifference, fear or reluctance of faculty to embrace new methods. Developing and running online courses also require a considerable investment of time by the faculty who design and administer them. Philip Stark estimates that he invests roughly four times more time supporting his online courses than traditional classroom courses, although he is able to cover 2.5 times more students in the process. By one estimate it requires up to 400 hours to convert a traditional lecture course into a fully interactive online learning experience. Once the course is developed, the time invested per student taught may come down dramatically and eventually prove far less than that of classroom training, but the high barriers to initial entry represent a real obstacle to rapid adoption of OLI courses by large numbers of faculty. John Mitchell estimates that about 100 members of the Stanford faculty will engage in OLI in 2013, representing about 5% of total faculty. If this is the case in the innovative birthplace of Coursera and Udacity, rates of adoption must be far lower in most other universities. At SJSU, another pioneer, thus far about 0.5% of faculty are presently engaged in OLI. These low participation rates reflect the fact that we are still in the very earliest stages of the OLI revolution and it is difficult to envision how far and what form these new learning platforms develop. OLI requires new types of infrastructure to support data capture and analysis to access the effectiveness of different tools and methods. In order to facilitate the radical transition of universities to cope with the challenges of an online environment, organizations such as 2U.com are partnering with academic institutions to bring their content online.

The development of OLI is also making it possible to harness the enormous knowledge and teaching capacity of retired faculty to fill the growing gap between the demand and availability of qualified instructors and to utilize their capabilities to teach people anywhere in the world.

The conception of the student is also rapidly changing. Today only 17% of college students in America are full-time. The traditional conception that employment follows higher education is no-longer valid. More and more people are going back to college to augment their learning either as a support for career development or a means to enrich their years in retirement. The average student in the USA works 19-20 hours per week, which means he or she is both student and employee. More than 40% of adults participate in formal and/or non-formal education in a given year across OECD countries. The average age of online learners is now 34, up from 27 in 2002. MOOCs may form a critical element in future educational systems designed to promote life-long learning. The relationship between education and employment must necessarily undergo a significant change in future in order to equip workers of all ages with the ever increasing range and levels of skills required to maintain competency in an increasingly sophisticated labor marketplace. Orio Giarini and Mircea Malitza called for transforming this relationship into a “double helix of learning and work”.<sup>18</sup>

MOOCs have also accelerated the globalization of education. Dan Clancy, Director of Education at Google, believes that the biggest shift in global education will be the rising importance of the non-Western world. Presently 60% of Coursera students are overseas and 80% already possess a college degree.<sup>19</sup> The six countries with the highest online enrollment in Coursera courses (after the U.S.) are Brazil (5.9%), India (5.2%), China (4.1%), Canada (4.1%), the United Kingdom (4%) and Russia (2.4%).<sup>20</sup> Among edX’s students, 9% come from Africa and 12% from India.<sup>21</sup> SJSU is training Pakistani instructors how to teach online. UC Irvine’s chemistry courses are being utilized by faculty in Africa.

## **5. Education as Dialogue**

No longer is education a one-to-many process. The emerging learning model is the network. In an age of mechanization and massification, it is easy to lose sight of the fact that education is essentially an organic process of transmission that takes place from one human being to another. The capacity to acquire, accumulate, codify and transmit knowledge from one person to another and from one generation to another is the most striking characteristic distinguishing human beings from other species on earth. No matter how powerful the technologies we develop for storage and delivery of information, education is a dialogue between living beings – an exchange of ideas and perspectives between conscious minds. Human interaction has always played and always will play an essential role in effective education. As Aftab Omer, President of the Meridian University, put it: “The challenge is to integrate high tech with high touch.”

Clancy likens recent developments in education to what has occurred in the television industry over the last few decades. Broadcast TV was the primary delivery mechanism until cable, satellite, VCR, digital video, the Internet and YouTube gradually made inroads into its territory. Today broadcast TV accounts for only 11% of total video viewing. Something similar is likely to happen in higher education, where until very recently brick and mortar universities accounted for the vast majority of knowledge dissemination. Clancy expects peer to peer instruction, including small group learning and team assessment, to play a much

greater role in the education of the future. As he put it, “The crux of education is social interaction.”

There was a time when reading and writing were rare endowments and the majority relied on a very few to perform these essential functions. Advances in education enable most people on earth to now perform these functions themselves, but we still rely on other minds to develop ideas and present knowledge in forms we can readily understand and absorb. Technological advances facilitate the delivery of knowledge from one mind to many others, but they have not and cannot entirely eliminate the essential role of thoughtful human interactions.

OLI cannot eliminate the need for human interaction in the learning experience. But it may radically alter the sources of that interaction. Ken Goldberg, a UC Berkeley professor, estimates that human beings currently spend about 10 billion minutes a day on Facebook and generate 400 million tweets. He and Yuko Okubo of Fujitsu have been collaborating to develop a social innovation tool called Opinion Space, a collaborative discovery engine that allows large groups to brainstorm.

In future some aspects of the role of the teacher may increasingly be performed by students themselves. Recent studies testify to an obvious truth which every instructor knows from personal experience, i.e. we learn best when we teach others. The absence of live contact with teachers has led the MOOCs to focus on ways to promote more interaction between students through online chat rooms, Q&A systems and physical meetings of their own. Coursera encourages both online and offline interaction. Online, the response time to questions posted on Coursera forums is 22 minutes. Offline, there are Coursera communities spread over 2,787 cities worldwide that enable students to connect with each other. Courserans in the same geographic location can form communities and plan meetings. Any member can suggest a date and venue to initiate a meeting to form study groups, share ideas, and socialize too. Online social learning platforms such as StudyRoom and Grockit facilitate meeting classmates outside the classroom. Students can join a study group for any subject of their choice, and share, collaborate, learn and teach. Educators can form their own virtual classes, and connect to their own and other students online. The service tracks student engagement and participation, and helps identify active and contributing students. StudyRoom monitors the level of interaction between students, incentivizing students who teach other students and making it possible for more advanced students with proven competence to earn money by offering assistance to students in courses they have already completed. 2U.com is also experimenting with ways to incentivize more advanced students to work with those who need assistance, so that mentoring forms an integral component of the learning process.

## **6. Evolution of the Textbook**

The classroom and the instructor are not the only things that are changing. The shift from print to electronic media is transforming the textbook from a passive medium for knowledge storage into an active, interactive, dynamic learning platform combining text, images, audio, video, animation, data analysis, self-paced learning and continuous performance assessment into an integrated learning system.

Pearson, the world's largest textbook publisher, is in the process of reorganizing itself around emerging technology and global needs. Data analysis of individual learning patterns now makes it possible to develop products that deliver personalized learning experiences to each student. Pearson is also experimenting how to promote virtual peering between students for both motivation and knowledge transfer. Pearson's ebooks have, in addition to the entire textbook, interactive quizzes, weblinks, audio, video, animation and search features. Highlighting and making notes are possible. They also allow the creation of study groups to share notes with friends. McGraw Hill's LearnSmart software serves as a personal tutor. It can predict what the student is most likely to forget, and when. It analyzes how students perform in embedded quizzes and which concepts stump them. It can then create a personalized reading experience by highlighting the most important concepts a student needs to learn at that moment. As the student progresses, it adapts and adjusts the content based on his or her individual strengths, weaknesses and confidence, ensuring that the time spent studying is efficient and productive.

The boundaries between information and edutainment are thinning. Digitization is also broadening the concept of 'textbook' to encompass the rich and varied reservoirs of quality content offered by sources such as National Geographic, Scientific American, Psychology Today and Discovery Channel.

Knowledge grows by free exchange. Globalization of access to information goes hand in hand with globalization of education. Creative Commons is a not-for-profit presently working with governments, educational institutions and foundations in 72 countries to establish global standards for open licensing of content that facilitates free sharing, while protecting the legitimate rights of authors. Google has already invested \$180 million to digitize about 30 million books, but without much revenue or needed legal agreements. Making access to the world's digital libraries universal will certainly be of great benefit to students worldwide. WAAS Fellow Lloyd Etheredge is working on a legal framework for an economically-sustainable digital Global Public Library, made accessible free of charge to individuals, including a usage-based, global payment system.

## **7. Accreditation**

Gone are the days when the university was the sole repository or delivery point for in-depth formal knowledge delivery. Universal access to information and knowledge codified as courses is leading to what Ralph Wolff, former President of the Western Association of Schools and Colleges (USA), terms the 'deinstitutionalization of learning'. He estimates that only about 17% of formal learning in the USA takes place in traditional programs. The rise of the MOOCs is leading to a coursification of learning, in which knowledge is delivered course-wise rather than degree-wise. There is an increasing emphasis on competency-based programs without credit hours, in which students study on their own and then are evaluated in terms of the extent of knowledge acquisition.

Accreditation is one of the greatest challenges faced by the plethora of emerging MOOC platforms. Hundreds of thousands of students are flocking to the MOOCs for free access to world-class course content, but the creation of professional quality courses is a costly,

time-consuming process requiring sophisticated technology and expertise and costing as much as \$100,000 per course. Moreover most students enroll in courses in order to obtain a valid proof of competency which will aid them in seeking a job or advancing their careers. Thus, accreditation is essential for the rapid adoption of online forms of education and the power of accreditation presently resides where it always has in traditional brick and mortar institutions.

Early adapters are experimenting with various ways to make OLI financially viable. For-profit startup, Coursera, is addressing this problem by offering certificates of completion to students who pay an additional fee. Some universities are offering credit for OLI courses provided students pay tuition fees and appear for physical exams. The University of Maryland University College has announced that starting from Summer 2013, it will award transfer credit to those who have taken and can prove what they have learned from certain MOOCs. To get credit, students will have to prove that they know the material, either by taking a paid version of the course, which includes proctored exams, or by going through a rigorous “prior learning assessment” process at UMUC, which measures competency on a topic.

The American Council on Education, which advises college presidents on policy, has evaluated MOOCs—five from Coursera and four from Udacity—and recommended to its members that students who pass those courses should be awarded transfer credits.<sup>22, 23</sup> San Jose State University, Georgia Institute of Technology, Colorado State University, the American Public University system, Central Michigan University, Kaplan University, Regis University, the State University of New York’s Empire State College and Western Carolina University award transfer credit to students who have studied through MOOCs.<sup>24, 25</sup>

A variety of new online institutions are also being formed to test alternative designs. University of the People is a free, online academic institution approved by the California Bureau for Private Postsecondary Education to award degrees and has applied for accreditation status. World Education University, which opened in February 2013, offers 100% free college level education to anyone, anywhere, anytime, supported by an innovative advertisement-based revenue model. Their academic catalog consists of 341 courses, and they offer 43 different degree and certificate programs. As of September 2013, WEU had students in 179 countries enrolled in their online courses. WEU is also in the process of applying for accreditation. Minerva Project aims to be an online Ivy League university, providing students with a four-year American university education, starting in Fall 2014. It hopes to receive accreditation through a partnership with the Keck Graduate Institute, a part of the Claremont University Consortium.

According to the old management maxim, you get what you measure. Therefore, new credentialing systems are based on the premise that learning involves much more than merely the acquisition of specific course content and that measures need to be refined to access acquisition of a much wider range of competencies than merely text and lecture based knowledge. Will degrees remain the primary credential for certifying learning? Possession of a university degree conveys relatively little specific information about the competencies a student

has acquired. New models such as Degree.com and Accredible.com are facilitating the shift from degree-based to skill-based learning models. The founders of Accredible, Alan Heppenstall and Danny King, envision a decoupling of the educational and certification processes. They are trying to shift the focus from certification of courses taken by students to validation of the actual competencies a person has acquired and can document, regardless of whether they were obtained through traditional classroom instruction, online learning, on the job learning or other forms of life experience. Accredible is a comprehensive and inclusive form of credentialing that makes it possible for individuals to develop their own personalized, customized knowledge profiles validated by a variety of means, including formal certification, the testimony of experts, and other forms of evidence. Alternative means of certification such as the one being developed by Accredible can play an important role in making MOOCs credible.

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*“A new paradigm in education must be based on new thinking.”*

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Another approach is being developed by Joanna Normoyle, Experiential & Digital Media Learning Coordinator at UC Davis, who is experimenting with new types of curriculum designing and new recognition systems to help students develop important skills necessary to address sustainability issues in the real world related to problem solving, thinking, communicating, design, visioning, marketing, management and social interaction. A system of badges is being used to incentivize new types of experiential learning, competence, knowledge and values.<sup>26</sup>

Globalization poses another challenge to traditional forms of accreditation. Education is going global. American universities are now educating about 800,000 foreign students every year.

American universities led by NYU are establishing campuses and affiliated degree courses overseas. As the size of their college-age populations levels or declines, European countries are also striving to attract more foreign students. At the same time, the promise of high quality education is attracting more students from developing countries to the world's premier institutions of learning. Standardization and internationalization of credentialing would significantly facilitate global educational exchange.

Globalization is giving rise to new models. Founded in 1999, Laureate International Universities network has grown to include 72 institutions in 30 countries throughout North America, South America, Europe and Asia. Institutions within the network operate both campus-based and online programs with a total enrollment of more than 780,000 students.

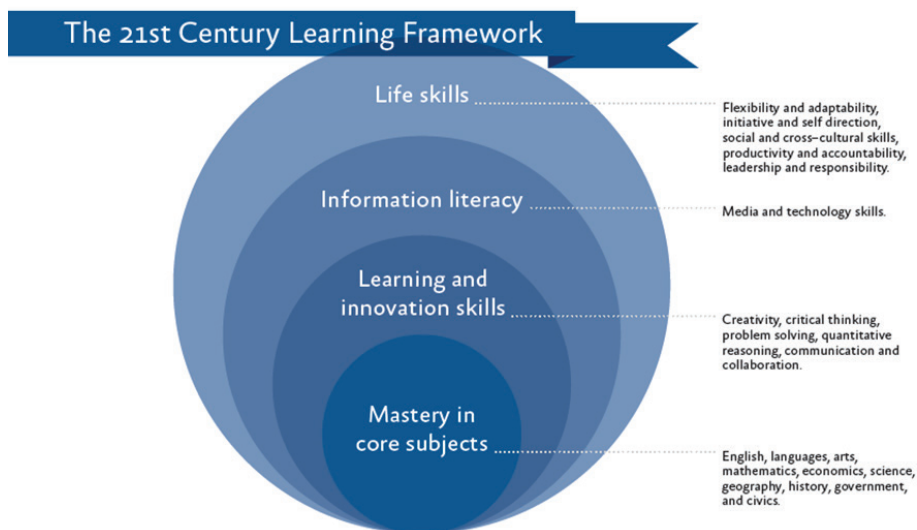
## **8. New Foundations for Higher Education**

A new paradigm in education must be based on new thinking. As one of the Academy's founding fathers, Albert Einstein, said *“We cannot solve our problems with the same thinking we used when we created them.”* Side by side with the need to educate more people better is the need to reconsider the intellectual foundations on which current knowledge is based. While technology has been a powerful driver for expanding access to affordable



education, a parallel movement is needed to re-examine prevailing notions regarding the fundamental purpose of education, the division of faculties into separate disciplines, and the essential nature of the knowledge needed for accomplishment in the 21<sup>st</sup> century. As Emil Constantinescu, former President of Romania and Rector of the University of Bucharest, observed, “Modern knowledge cannot and should not be reduced to a technical compilation and use of information. Knowledge has to be co-extensive with the depth and breadth of human wisdom, accumulated over millennia. Bare information opens a royal way to massification, whereas knowledge stimulates the harmonious development of responsible individualities.” While concern with foundations of knowledge and education is not new, the tumult of change stirring higher education today has created the need and opened the way for greater exploration of these profound issues.

**Figure 5: The Learning Framework for the Future**



We have already noted the emerging shift from subject to person, from teaching to learning, from concentration of content to concentration on the learning process. The essential goal of all education is to enhance the capacity of the student to acquire and utilize knowledge in a living social context, which includes the ability to seek, gather, process, assess and absorb ideas, information and experience; to modify existing understanding based on new facts and perspectives; to utilize what is known to solve problems involving aspects that are uncertain or unknown; to interact effectively with other people both for the exchange and enhancement of knowledge; and to apply all these capacities to enhance all aspects of human security, social welfare and psychological well-being. Most of these objectives are at best incidental or even contrary to the design and actual delivery of most higher education models today. We need to foster at every level of society an awareness of the social construction of



reality, of our powers and responsibilities for the present and future of humankind and the whole planet. We need more effective intellectual perspectives to correctly diagnose the problems and formulate effective, sustainable solutions.

Mohammad Qayoumi supports the call of the US-based Partnership for 21<sup>st</sup> Century Skills for a wider conception that embraces core subjects, learning and innovation skills, information literacy and life and career skills as depicted in Figure 5.<sup>27, 28</sup>

*“Social reality is not divided into courses and disciplines – it is an indivisible whole.”*

The felt need for new learning paradigms is a reason for the success of unconventional alternative learning models such as UnCollege.org, which was founded by college drop-out Dale Stevens in 2011. Stevens refers to his model as unschooling to contrast it with traditional forms of homeschooling. UnCollege offers students an opportunity to learn how to learn in non-traditional environments while taking a year off from college. It offers The Gap Year, a one year program that consists of a residential program with other UnCollege Fellows, a stint abroad, an internship, and ends in the completion of a real project. This one year helps students to develop meta learning skills. They participate in workshops and roundtables, meet entrepreneurs, work or volunteer in a foreign country, and gain real world work experience. The internship may be at a giant tech company, a small startup, or a charity distributing aid in Africa. The project could be organizing an exhibition of photographs, publishing a book, or creating a functioning company. UnCollege introduces the Fellows to a network of mentors, and offers them assistance in becoming financially independent at the end of the program. Stevens’ ultimate objective is more revolutionary. It is to offer a complete alternative to formal higher education that will more effectively equip youth with the initiative, confidence, problem-solving capacities and social skills needed for success in any field of endeavor.

The World Academy is focusing on the future of education precisely because education is such a powerful determinant of our collective capacity to address the pressing issues confronting humanity today. Although interdisciplinary and multidisciplinary courses have been around for decades, they still occupy a marginal place in higher education, often perched precariously between two or more stools of conventional disciplines. But social reality is not divided into courses and disciplines – it is an indivisible whole. Economic and financial issues are inextricably interlinked with and based upon issues of law, governance, human rights, social process, individual psychology, culture, geography, ecology and historical development. This is the rationale for the Academy’s quest for a New Paradigm for Human Development that recognizes the common theoretical foundations and practical implications of the world’s most pressing challenges.

Throughout history, education has gradually and incrementally evolved in response to changing social needs, more commonly to conserve past achievements than to pioneer the future. As Roberto Peccei, former Vice Chancellor of UCLA, put it, “Universities are better suited as repositories of knowledge than as agents of change.” In future we need institutions that will not only transmit the rich heritage of past knowledge to younger generations, but also pioneer the ideas needed to build a better world.

Robert Fuller, former President of Oberlin College, describes education as the single best weapon of counter-terrorism to meet global threats. As American colleges in the 1970s became the active instrument for racial integration in response to rising levels of social unrest, effectively creating a black middle class, Fuller says that today the world faces a similar challenge at the global level, the challenge of rapidly developing the potential of more than one billion people in developing countries to create a global middle class. WAAS can be a leader in that movement.

At a still deeper level, education is founded on and inseparable from human values. Values represent the quintessence of wisdom acquired over centuries as to the fundamental principles governing human accomplishment, individual and social. They are not merely inspiring ideals. They also have profound practical importance. Formal education supported by family, culture and religion are the principal means for the transmission of values from one generation to the next. The multiple crises confronting humanity today are indicative of a need to consciously inculcate higher values through the educational system.

The achievements of Western society have been made possible by recognizing the value of the individual human being and providing the widest latitude of freedom for individual development. Its problems arise from the absence of a corresponding emphasis on individual social responsibility to the collective that has contributed so much to enhance the life of its members. Technology and organization have been powerful drivers of social progress, yet in the process they have almost come to supplant and suppress the value of the human beings who have developed them and whose welfare they intended to serve. Modern science and technology are a superb testament to human creativity, but become monstrous when applied without reference to their impact on people. Modern organization is godlike in its effectiveness, but it becomes inhuman when a system or procedure is divorced from human welfare and well-being. No longer can we abide by the notion of education as purely objective, neutral and value-free. If it does not consciously impart values of freedom, equality and dignity for all, then by that very omission it sanctions their very opposites.

As education goes global, great care must be taken to counter a subtle form of cultural imperialism that will almost inevitably impose Western values on populations whose cultural heritage is very different from our own. Conscious efforts should be taken to promote MOOC courses by scholars and experts from all cultures, so that the university of the future truly becomes a global learning ground where all cultures can gain and all can give. Conscious emphasis must be placed on those values which are truly universal and on respect for cultural differences, whether they result from geographic distinctions between people or from societies in different stages of social development.

## **9. The Ultimate Question**

The Millennium Development Goals focus on primary education. In contrast, the Berkeley discussion gave voice to the conviction that higher education can and should be made available to all and it called for recognition of access to higher education as a fundamental civil right.

Much of the experimentation witnessed so far is an effort to use familiar methods to meet the needs of a new context, when what is really required is to evolve a new approach at a higher level. The rapid expansion of global needs and capabilities calls for the formulation of an entirely new paradigm for global education.

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*“Today a World University is an idea whose time has come.”*

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It is far too early to predict the most likely form that global higher education will take in the coming decades, but the forces driving that change are sufficiently powerful to ensure it will be very different than the form that has endured with only minor variations over the past two centuries. Reflection on recent developments helps us formulate the questions that need to be asked. But, as Ralph Wolff, put it, “If you think you know the answers, you just aren’t asking the right questions.”

The World Academy's Forum at UC Berkeley sought to pose the ultimate question to participants which no one seems yet to be asking: “If you were asked to design a world-class system of higher education accessible to all human beings, how would you do it?”

The question has already evoked some inspiring answers. Lloyd Etheredge envisions a Global University Movement whose mission is to provide “An education equal to the best in the world, available to everyone.” Going beyond MOOCs, it would include many educational and technical options, honoring the dignity of each individual, a world that warmly welcomes each young person and is committed to providing resources for them to develop their potential and have a life that they love, lighting fire under national and local government officials to make supportive investments for rapid progress, generating solutions to translation challenges, volunteering enrollment for tutoring and coaching, creating opportunities for private sector startups in each country, and developing a Global Public Library of at least 30 million volumes available to the global public free of charge.

## 10. World University Consortium

The World Academy was founded in 1960 by distinguished individuals concerned by the impact of the explosive growth of knowledge to address global issues related to the social consequences and policy implications of knowledge. Their aim was to create a forum where problems can be discussed objectively, scientifically, globally and free from vested interests or regional attachments, to arrive at solutions that affirm universal human rights and serve the interests of all humanity. WAAS was founded on faith in the power of original and creative ideas – Real-Ideas with effective power to change the world and its motto is “Leadership in thought that leads to action”.

The Academy’s founders intended that WAAS should function as “*an informal World University at the highest scientific and ethical level, in which deep human understanding and fullest sense of responsibility will meet.*”<sup>29</sup> Although some modest beginnings were made in its early years to establish regional centers of excellence, political conditions at the height of the Cold War, as well as limitations in transport and global communication, posed insurmountable obstacles to realize this vision at that time. Today a World University is an idea whose time has come.

A major objective of the Berkeley conference was to assess the need and potential for the establishment of new types of educational institutions dedicated to realizing this vision. The World Academy's Forum on Global Higher Education provided an excellent opportunity to examine recent advances, brainstorm on new models and creative solutions for establishing a world-class system of higher education available to all humanity and to forge an international alliance of stakeholders committed to making it happen.

At the forum, the leadership of WAAS announced the founding of the World University Consortium, a network and umbrella group to facilitate educational partnerships and linkages with other interested stakeholders at the international level, to provide a centralized source of information about latest innovative ideas and developments in this field, and to explore creative solutions to enhance the reach, quality and relevance of higher education globally. A radical change in conception is imperative. A truly global education cannot be limited to the perspectives of one or a few nations or cultures.

The mission of the Consortium will be to evolve and promote development of accessible, affordable, quality higher education worldwide based on a human-centered approach that shifts the emphasis from specialized expertise to contextualized knowledge within a trans-disciplinary conceptual framework reflecting the complexity and integration of the real world. It will strive to shift the emphasis of higher education from teaching specialized content to learning that enhances the capacity of students to think and discover knowledge for themselves, from theoretical mastery to acquisition of knowledge, skills and values relevant to each individual's personal development and career – an educational system better suited to develop the full potentials of social personality and individuality for productive engagement, social welfare and psychological well-being.

The consortium will pursue several closely interrelated objectives. It will strive to identify best practices globally and promote effective models to improve accessibility, quality, affordability, employability, innovation and social relevance in higher education. It will explore innovative open learning systems and online and hybrid delivery systems. It will encourage experimental research and application of advanced methods to improve the learning process. It will promote person-centered approaches that emphasize self-guided learning, critical and original thinking, inspirational forms of instruction, learning to learn, cross-cultural and trans-cultural, multi and trans-disciplinary contextualized perspectives and experiential learning.

From its inception, the greatest resource of the World Academy has been the network of its talented, committed members and the many other individuals and institutions with which our members are closely bound by work and values. WAAS is an embodiment of the ultimate value of the human resource and the unlimited creative potential of human beings. The Consortium will seek to create a worldwide forum where all the stakeholders can meet, interact and create new networks, partnerships and projects.

Many excellent ideas have already been proposed regarding the range of activities the Consortium may undertake in pursuit of its mission and objectives. In the coming year

WAAS will be reaching out to its Fellows and partnering institutions to formulate strategies, establish priorities and frame a plan of action. We invite all those within and outside the Academy to join us in this collective endeavor.

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## **The Future of Water: Strategies to Meet the Challenge**

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### **Abstract**

*Despite the UN's adoption of a new economic and social right in 2010 – the Right to safe drinking water and sanitation – the deficit of fresh water is becoming increasingly severe and large-scale.*

*The mounting water crisis and its geography make it clear that without resolute counter-action, many societies' adaptive capacities within the coming decades will be overstretched.*

*The scale and the global nature of the water crisis demand a new level of statesmanship, of vision and of international action. To master successfully the threats of water crisis, not only its effects, but essentially its underlying causes must be addressed by implementing structural changes in our water policies and economies. This requires a coherent strategy in which the economic, social, water and environmental aspects of policy must be properly coordinated.*

*The world needs a standalone comprehensive "water goal" in the post-2015 development agenda, based on principles of equity, solidarity, recognition of the limits of our planet and rights approach, and linking development and environment in analyses and in governance policies. Such a goal would address the three interdependent dimensions of water: Water, Sanitation and Hygiene, Water Resources Management and Wastewater Management and Water Quality.*

*Scientific understanding of water risks and worldwide evidence clearly define the challenges to be addressed and provide a sound basis for policy; the resources required could be made available if the water agenda is given sufficient priority; and the benefits and opportunities of early action are undeniable. In fact, the moral, scientific and practical imperatives for action are established.*

The United Nations' General Assembly recognized a new economic and social right in 2010 – the Right to safe drinking water and sanitation.

Despite the UN's adoption of this vital principle, the deficit of fresh water is becoming increasingly severe and large-scale – whereas, unlike other resources, there is no substitute for water.

While the drinking water target has officially been met according to the UN's criteria (based on the number of pipelines) and statistics, in reality the existence of a pipe does not



necessarily mean there is clean water reliably flowing out of it; and even if there is, it may be very far away, or priced at a rate which some people cannot afford. More worrying still, recent reports show that drinking water availability in Africa is declining, and the UN Habitat warns that by 2030 more than half the population of huge urban centers will be slum dwellers with no access to safe water or sanitation.

The mounting water crisis and its geography make it clear that without resolute counteraction, many societies' adaptive capacities will be overstretched within the coming decades. This could result in massive migration, destabilization and violence, jeopardizing national and international security to a new degree. As John F. Kennedy rightly observed in the early 1960s: "Anyone who can solve the problems of water will be worthy of two Nobel Prizes – one for peace and one for science." The observation made 50 years ago has become more appropriate today.

The figures are staggering. The UN Food and Agriculture Organisation estimates that by 2025 1.8 billion people will be living in regions stricken with absolute water scarcity, while two-thirds of the world population could be living under stress conditions. The United Nations Environment Programme (UNEP) assesses that, by 2025, water withdrawals will increase by 50 percent in developing countries, and 18 percent in developed countries. According to UNEP and UN Habitat, about 80 percent of wastewater from human settlements and industrial sources is discharged to the environment without treatment. Last but not the least, the IPCC report suggests that by 2050 annual average runoff will have increased by 10%-40% at high latitudes and decreased by 10%-30% over some dry regions at mid-latitudes and semi-arid regions at low latitudes.

As always, the cost of no action will be much higher than that of action. The return on investment for providing basic services need not be demonstrated anymore. For safe drinking water and sanitation, the World Health Organization estimated returns of \$3-\$34 for each \$1 invested depending on the region and technology. Worldwide, more than 7,000 major disasters have been recorded since 1970, causing at least \$2 trillion in damage and killing at least 2.5 million people. The Stern Review on Climate Change published in 2006 concluded that by 2050 extreme weather could reduce global GDP by 1% and that climate change could cost the world at least 5% in GDP each year if left unabated. If even more dramatic predictions come to pass, the cost could rise to more than 20% of GDP.

## 1. Where We Stand Today

There will be 220,000 people at the dinner table tonight who were not there last night—many of them hungry, thirsty and desperate. Population growth is one of the major drivers of the multiple changes taking place around the world, including in terms of economic activity and availability of natural resources like water.

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*"The UN Habitat warns that by 2030 more than half the population of huge urban centers will be slum dwellers with no access to safe water or sanitation."*

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Humanity currently uses half of the accessible 12,400 km<sup>3</sup> of freshwater per year. The bad news is that the water use is growing even faster than the population: water consumption in the 20<sup>th</sup> century grew twice as fast as the world population. As a result, a third of the world's population lives in water-stressed countries now. By 2025, this is expected to rise to two-thirds.

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*“Since 70 percent of world water use is for agriculture, water shortages inevitably translate into food shortages. By 2050, after we add another 3 billion to the population, we will need an 80 percent increase in water supplies just to feed ourselves.”*

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The problem of overcoming the water crisis comprises many complex and controversial questions. But thinking about ways of countering the global water crisis, we must first of all recognize its direct causes.

They include:

***1.1 The growth of the world's population and of agricultural, industrial and energy production, which are the main consumers of water;***

The global population tripled in the 20<sup>th</sup> century but water consumption went up seven-fold. Half the world's people already live in countries where water tables are falling as aquifers are being depleted. Since 70 percent of world water use is for agriculture, water shortages inevitably translate into food shortages. By 2050, after we add another 3 billion to the population, we will need an 80 percent increase in water supplies just to feed ourselves.

Already, around one billion people are chronically hungry, and by 2050 agriculture will have to cope with these threats while feeding a growing population with changing dietary demands. This will require doubling food production, especially if we are to build up reserves for climatic extremes.

To do this requires sustainable intensification – getting more from less – on a durable basis.

***1.2 The environmental consequences of economic activities and the destruction of natural ecosystems;***

Current estimates of global GDP are around US\$ 60 trillion and even at modest per capita growth rates in the emerging economies of the world we could easily see a world (as we conventionally measure it today) with a GDP closer to US\$ 200 trillion that would meet poverty targets – three worlds sitting on our present one world but stretched to the limits with regard to consumption and production patterns.

We are polluting our lakes, rivers and streams to death. Every day, 2 million tons of sewage, industrial and agricultural waste are discharged into the world's water, the equiva-

lent of the weight of the entire human population of 6.8 billion people. 80% of the world's rivers are now in peril, affecting 5 billion people on the planet. We are also mining our groundwater far faster than nature can replenish it, sucking it up to grow water-guzzling, chemical-fed crops in deserts or to water thirsty cities that dump an astounding 750 million m<sup>3</sup> of land-based water as waste in the oceans every year. The global mining industry sucks up another 750 m<sup>3</sup>, which it leaves behind as poison. Fully one third of global water withdrawals are now used to produce biofuels – enough water to feed the world. A recent global survey of groundwater found that the rate of depletion more than doubled in the last half century.

*“The amount of wastewater produced annually is about six times more than the water present in all the rivers of the world.”*

### ***1.3 Wasteful use of water and other natural resources in an economy driven by hyper profits and excessive consumption;***

The amount of wastewater produced annually is about six times more than the water present in all the rivers of the world.

In many places of the world, a staggering 30 to 40 percent of water or more goes unaccounted for due to water leakages in pipes and canals and illegal tapping.

In the US some of the 852 billion litres wasted each year through over-watering can be saved by installing smart systems which deliver just the right amount of moisture.

City landscaping or “urban irrigation” makes up 58 percent of urban water use, besides the water wasted which generates over 544,000 tons of greenhouse gases annually.

U.S. water-related energy use is at least 521 million megawatt hours a year – equivalent to 13 percent of the nation's electricity consumption.

The carbon associated with moving, treating and heating water in the U.S. is at least 290 million tons a year.

### ***1.4 Mass poverty and backwardness in countries where authorities are not able, and often have no desire to organize effective water management;***

Almost two in three people lacking access to safe drinking water survive on less than 2 dollars a day and one in three on less than 1 dollar a day.

World Bank estimates that 53 million more people were trapped in poverty last year, subsisting on less than \$1.25 a day, because of the crisis. This comes after the soaring food and fuel prices of recent years, which pushed 130 to 155 million people into extreme poverty, many of whom have still not recovered.

Dirty water is the biggest killer of children; every day more children die of waterborne disease than HIV/AIDS, malaria and war together. In the global South, dirty water kills a child every three and a half seconds. And it is getting worse. By 2030, global demand for water will exceed supply by 40%—an astounding figure foretelling terrible suffering.

It is not surprising that virtually all of the top 20 countries considered to be “failing states” are depleting exponentially their natural assets—forests, grasslands, soils, and aquifers—locked in a vicious circle to sustain their rapidly growing populations.

### ***1.5 The arms race and the senseless waste of enormous amounts of wealth and resources in wars and conflicts;***

Roughly ten years ago, James Wolfensohn said he was not able to comprehend why the world spends only 50 billion dollars on development aid annually while it squanders a whopping 950 billion dollars on its armed forces. “If the world’s rich nations spend the 950 billion dollars to really fight poverty and disease,” he argues, “they would not need to spend even 50 billion dollars fighting wars.”

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*“US\$105 billion was spent on nuclear weapons in 2011, up from US\$91 billion in 2010. Shifting spending (and this is mere 7% of the world military budget!) away from weapons to sustainable development would have profound impacts on the lives of over 3 billion people and would promote security and stability around the world.”*

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Today, the world spends twice as much on war. Two decades since the end of the Cold War, over 20,000 nuclear weapons still exist, with many on high alert and each weapon much deadlier than those that devastated Hiroshima and Nagasaki in 1945. US\$105 billion was spent on nuclear weapons in 2011, up from US\$91 billion in 2010. Shifting spending (and this is a mere 7% of the world military budget!) away from weapons to sustainable development would have profound impacts on the lives of over 3 billion people and would promote security and stability around the world. Spending US\$105 billion annually over five years towards sustainable development could:

- Lift 1 billion people out of poverty.
- Allow 60 million more children to live past their 5<sup>th</sup> birthday.
- Supply 700 million people with clean drinking water.
- Give 1.3 billion people access to basic sanitation.
- Provide 280 million children with proper nutrition.

In light of these various negative impacts, a question must be posed to political and economic leaders: For them to respond to the water and related environmental crises, and ensure the better management of these resources, how severe must the resource and ecological risks on a nation’s economy become before they act, and how do these factors affect a nation’s ability to pay its debts?

There are many economic justifications for action. A 10% drop in the productive capacity of soils and freshwater areas alone could lead to a reduction in trade balance equivalent of more than 4% of GDP.

And we should start thinking not exclusively in terms of associated expenses, but also in terms of the cost of not providing access to water. People without access to basic water supplies and sanitation, especially in Asia, Africa and Latin America, work fewer days because of illnesses and diseases. WHO estimates that meeting the MDG goal for water and sanitation by 2015 will result in productivity gains above US\$700 million per year solely from there being fewer cases of diarrhea for health systems to manage.

## 2. The Water-Energy Nexus

The water crisis cannot be decoupled from its energy dimension.

Europe's power sector accounts for 44% of all water withdrawals, and 8% of consumption – mainly evaporation in cooling towers. China already faces a water shortage of 40 billion m<sup>3</sup> per year, yet coal-fired generation is expected to increase 43% by 2020. It already accounts for around 60% of total industrial water demand. Peter Evans, Director for global strategy and planning at General Electric Co., told during a Tokyo conference that Asian utilities are “assuming the water is there. They actually will not be able to build as many coal plants as the projections suggest.”

Coal, gas and nuclear power generation all use large amounts of water. Of these, nuclear is the thirstiest. A combined-cycle gas turbine plant of around 450 megawatts could consume 74 million m<sup>3</sup> of water during its lifetime, and a coal-fired power station of 1.3 gigawatts no less than 1.4 billion m<sup>3</sup>. The latter figure is seven times the annual water consumption of Paris.

By contrast, wind and PV generation use very little water. The renewable technologies that consume water are solar thermal electricity generation, biomass and waste-to-energy, geothermal, and in a more direct sense, hydro-electric.

Policy-makers are showing signs that they are increasingly prepared to ensure the energy sector pays an appropriate cost for the water it uses. The European Union has reviewed its water policy goals as part of its Blueprint to Safeguard Europe's Waters.

But in the US, the energy sector's use of water looks like it is set to soar despite the deployment of renewable energy. This is because of non-conventional gas. While shale gas has become a live political issue in that country, coverage has almost purely focused on the issues of fugitive emissions, ground-water contamination, and whether the process should be regulated at a Federal or State level.

What has not been debated is the actual consumption of water.

Chesapeake Energy Corp. reports that drilling a deep shale gas well requires up to 2,000 cubic metres of water, but the “fracking” process requires, on average, an additional 20,000 cubic meters to be injected per well at high pressure to break up the rock. Multiply this by the hundreds of thousands of fracked wells needed to meet the increasing gas demand in the coming decades, and that's a lot of water. Some may be reusable, as long as the salinity is not too high, while some may require a significant amount of wastewater treatment and energy. The costs of this post-processing must be accounted in the price of shale gas energy.

Fracking supporters like to compare its water use with that of corn ethanol – not exactly a champion for the rational, fact-driven deployment of clean energy. The real comparison should be between gas-fired generation based on fracking, and wind or PV. On that count, the water factor comes down strongly in favour of renewable energy.

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*“To meet the threats of water crisis successfully, we must address not only its effects but also essentially its underlying causes, by implementing structural changes in our water policies and economies. This requires a coherent strategy in which the economic, social, water and environmental aspects of policy must be properly coordinated.”*

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### **3. What Next?**

The scale and the global nature of the water crisis demand a new level of statesmanship, of vision and of international action. To meet the threats of water crisis successfully, we must address not only its effects but also essentially its underlying causes, by implementing structural changes in our water policies and economies. This requires a coherent strategy in which the economic, social, water and environmental aspects of policy must be properly coordinated.

Major issues, whose scale and importance were not reflected in the MDGs, are those of our decreasing per capita water supplies, of the overuse and sometimes irremediable pollution of our watersheds, of the predicted conflicts over water usage and of the looming impact of climate change on the water cycle. The process that led to the adoption of the MDGs had only retained the humanitarian aspect of these well-established trends.

Today the world needs a standalone comprehensive “water goal” in the post-2015 development agenda linking development and environment in analyses and governance policies. Such a goal would address the three interdependent dimensions of water: Water, Sanitation and Hygiene, Water Resources and Wastewater Management and Water Quality. Setting the goal will not be an instant “silver bullet” solution. But it would reflect the needed awareness and mobilization of those who have the power to make things change.

The goal must be based on principles of equity, solidarity, recognition of the limits of planet and rights approach, coupled with effective means to check and demand the accountability of all stakeholders. It should help distinguish between the different aspects of water use and the related rights and obligations of different participants in this process at the local, national and international levels.

It should advance water innovation, smart water solutions and recycling that need to be introduced in the next 5-10 years.

Water justice must become a recognized and operational element of new water strategy. The UN’s resolution declaring water as a human right urges States and international organi-

zations to provide finance, capacity-building, and technology transfer through international assistance and cooperation, especially to developing countries.

In rich countries, the state has invested in water infrastructure over the centuries and progressively asked consumers to cover the cost of water services. Many developing countries are so deeply in debt that the state is unable to invest in infrastructure without the support of the international community. We cannot expect poor people to pay for water infrastructure; most people could possibly pay a reasonable, affordable charge for their water services.

Therefore, the new financial mechanisms urgently need to be put in place. Decentralised financing and cooperation must be enhanced, including targeted development loans guaranteed by local authorities from the North.

In conclusion, a scientific understanding of water risks and worldwide evidence clearly define the challenges to be addressed and provide a sound basis for policy; the necessary lines of action have been identified; the resources required could be made available if the water agenda is given sufficient priority; and the benefits and opportunities of early action have been demonstrated. In fact, the moral, scientific and practical imperatives for action are established.

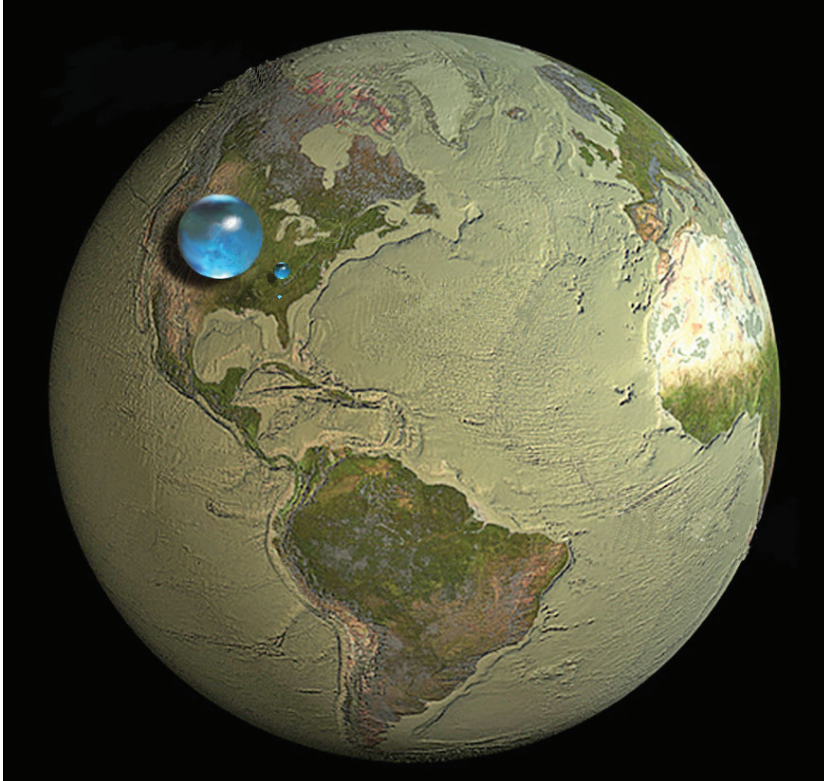
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## **ADDENDUM**

### ***The Actual Volume of Water on Earth\****



We are used to think of the Earth as “blue planet”, more than two-thirds of the surface of which is water. But the world’s oceans is a very thin layer of water when you compare it to the scale of the planet. Experts of the U.S. Geological Survey created the infographic that demonstrate how small – in comparison with the Earth – the volume of water we have.

The biggest blue sphere – it is all the water on our planet, including the one that is inside the bodies of plants and animals and people. The diameter of the sphere is 1,384 kilometers, and its volume is 1.386 billion cubic kilometers. Scope of smaller volume – a liquid fresh water in all the rivers, lakes, wetlands and groundwater. Its volume – 10,633,450 cubic kilometers.

Finally, a tiny blue dot – this is fresh water of all the lakes and rivers on the planet, which amounts to 93,113 cubic kilometres.

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\* Department of the Interior/USGS, U.S. Geological Survey/photo by Jane Doe

## Climate Policy after Doha: Turning Obstacles into Solutions

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### Abstract

*The international climate policy is in big trouble. The governments of the world cannot agree on a reasonable, enforceable cap on global CO<sub>2</sub> emissions – not today and not in the future. Concerning a strict enough cap, this issue is politically not handleable today, because this would directly interfere with the options of countries to generate future economic growth. Problems in this respect are politically unfeasible.*

*The present text, therefore, argues for a new approach, for thinking out of the box, for overcoming the traps the negotiations are stuck in at the moment. The idea is to have governments agreeing only on a relaxed instead of a strict cap. This is politically much easier to achieve. In the text, we show that a relaxed cap is sufficient to solve the climate issue, if the private sector can be motivated to do the rest, given that there is an enforceable relaxed cap in place. The private sector can use at least two wild cards to contribute to this aim, and it can do this within the framework of climate neutrality for companies, organizations, and individuals to take legal CO<sub>2</sub> certificates out of order on the one hand, and, on the other hand, to plant trees (all over the world for the purpose of biological sequestration) and to do this in huge volumes.*

The so-called Copenhagen Accord is taken as an anchor for a global climate regime to reach the 2°C aim. The regime consists of two parts: a moderate dynamic global CO<sub>2</sub> cap guaranteed via globally binding governmental accords, and a second part using two wild-cards. These are used to fulfill the so-called WBGU budget restriction in spite of the relative weakness of the agreed upon dynamic cap: (1) a massive decomprising of emission rights in a wealth-compatible manner to close the so-called negotiation gap and (2) a massive forest and landscape restoration program to close the so-called sequestration gap. Implementing the wild cards is financed by the private sector (organizations, companies, individuals) to achieve individual climate neutrality for ethical or reputational reasons. This process has already started and has been activating millions of dollars of private money annually with additive positive effects on development of non-industrialized countries.

### 1. Prevailing Frustration

International negotiations on climate are stalling. Tens of thousands of traveling mediators are urging NGOs and journalists to play their part, since the volume of climate gas

emissions continues to grow and there is frustration all over the place. Many observers have long since abandoned the 2°C target and no longer argue in favor of climate protection but in favor of population protection against the consequences of a climate disaster which can no longer be prevented.

## 2. Do we still stand a Chance?

There is still a chance, however, only if there is a change in the current negotiation logic. Over time, the present negotiation logic has outlived itself; the situation has changed drastically. What is now required are new approaches: increase system-related intelligence in order to get the global community out of the rat-race of the present negotiation logic.

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*“The world needs a new negotiation approach and a strong wildcard combined with an understanding of the fact that insisting on the present approach will bring about the ultimate climate risk.”*

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## 3. All Balance Sheets have Two Sides

The present negotiation logic aims at the reduction of annual global climate gas emissions to a sufficiently low level. This should allow humanity to stay within the limits of a continually decreasing total budget of still acceptable CO<sub>2</sub> emissions from fossil sources, summing up the emissions over the years until 2050. This **amount** is called the WGBU-budget restriction and is almost 750 billion tons (WBGU, 2008 and WBGU, 2011). There have been year-long debates as to the actual size of such a budget, its distribution among the nations and the related monetary transfers from the North to the South. A workable compromise has never been reached. Today, a climate contract as per the above logic is factually no longer feasible as the limitation of emissions would have to be to such an extent that it would render the preservation of wealth worldwide as well as the **legitimate economic growth ambitions** of emerging countries impossible. No government would be able to provide an answer to such a situation to its citizens. In the short term, present wealth is more important than potential future climate problems.

This is exactly why the world needs a new negotiation approach and a strong wildcard combined with an understanding of the fact that insisting on the present approach will bring about the ultimate climate risk. Increasingly stringent limitations while adhering to a continually decreasing remaining budget for still acceptable emissions until 2050 will no longer suffice. In the short term, we will not be able to implement a limitation to the necessary extent. The new task at hand is now to actively manage the atmosphere's CO<sub>2</sub> content. In doing so, the following observation is critical:

The CO<sub>2</sub> balance of the atmosphere has **two sides**. Besides the climate gas emissions aspect, there is the aspect of CO<sub>2</sub> retrieval from the atmosphere.

The latter must be massively pursued in the future in order to win time for the still indispensable climate-sensible reconstruction of our global civilization.

#### 4. A New Logic

A potential new logic for a global climate contract, which is a pragmatic approach, was developed in Copenhagen in the form of a common understanding between China and the USA. This needs to be appreciated, pursued and implemented. This pragmatic proposal makes sense even today, though it is admittedly incomplete. The Copenhagen formula conceived by China and the USA is a realistic compromise which smartly extends and improves the Kyoto formula, which was renewed at the last minute in Doha for welcoming the time of transition. The Copenhagen formula may function as a basis for a global climate contract which could be signed in 2015 for validity till 2020 (or even earlier). As per the following logic, it would result in a significant improvement of the Kyoto formula:

The **industrialized nations** will absolutely lower their emission levels and declare individually and voluntarily how much their emission levels are. The **non-industrialized nations** will lower their emission levels relatively to their economic growth rate and declare their current emission levels individually and voluntarily. Voluntary payments of industrialized nations into a climate fund for the benefit of non-industrialized nations shall support the non-industrialized nations.

The core of this compromise is voluntary self-obligation by the nations. Such a scenario is politically sustainable and allows the nations to orient themselves with their respective individual possibilities. All nations will be involved with the emerging nations, and will be required to curb limitations relative to their economic growth in the coming years. This will result in a (dynamic) cap of the overall emission volume, depending on the economic growth rates of the non-industrialized nations (Herlyn, E. L. A., Radermacher, F. J., 2012 and Radermacher, F. J., 2010). This is not yet the full solution to the climate problem but may be smartly amended in a modular way with other building blocks in order to finally form a complete solution. **The solution's weakness which lies in its incompleteness ultimately becomes its strength**, as it (1) can be accepted by almost all states and (2) is extendable by including the private sector in the right way. All major nations have already signaled their participation. This fact allows for the integration of **WTO border tax adjustments** with regard to non-participating nations as a powerful additional lever for the implementation of an airtight climate regime. It is almost a "Munchausen" scenario. The perfect solution is within reach because its "anchor" part is sufficiently unambitious to allow broad approval. However, still missing is the second half for which proper design and implementation are crucial. In this situation, wildcards are badly needed.

#### 5. The Wildcards

Who will see to the decommissioning of emission rights in a wealth-compatible manner (closure of what is known as the **negotiation gap**) and who will subsequently see to the

retrieval of the emissions from the atmosphere which will still be too high despite the conducted decommissioning (closure of what is known as the **sequestration gap**)? What mechanisms can be employed for this task?

**Figure 1: A climate contract in line with Copenhagen and Cancún  
– some caps and reduction paths**

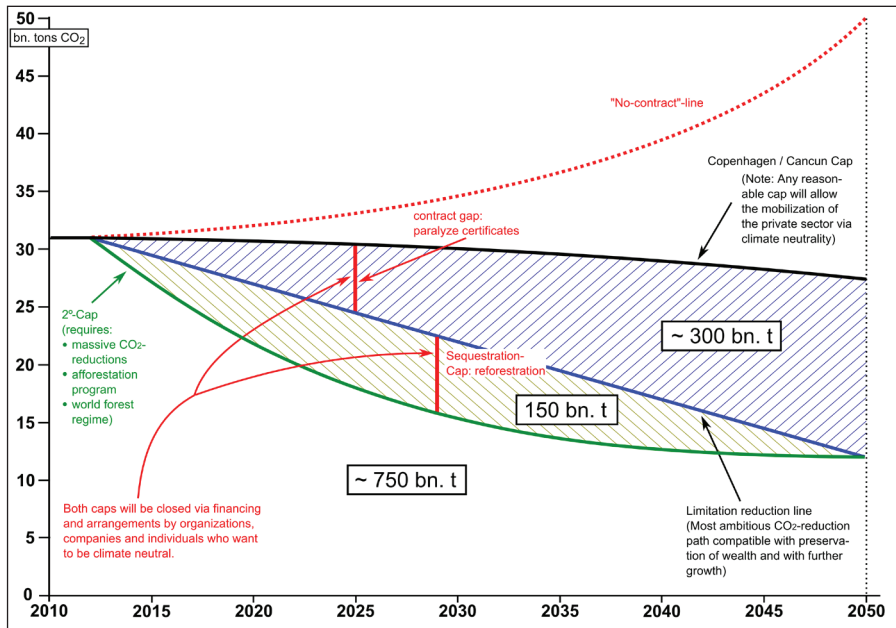


Fig. 1 shows the **present development** of global CO<sub>2</sub> emissions from fossil sources (red line), which is a disaster, and a (black) cap-line of the Copenhagen type, propagated as sufficient for the “anchor” part of a working global climate regime in this text. It shows further the approximated position of the **limit-reduction line**, compatible with global economic growth and development conditions, which has to be fixed every year politically at a technical level. And it shows the 2°C curve (green), which would be sufficient to stay within the WGBU budget restriction. The area between the black and the blue lines represents the **contract-gap**; the area between the blue and the green line, the **sequestration-gap**. These gaps have to be closed.

For the tasks described, e.g. to close the gaps, we have two wildcards on the table: (1) The **decommissioning of emission rights** to the extent in which it is compatible with global wealth and growth perspectives. The volume allowed to this end can be negotiated and agreed upon among the nations of the world on a yearly basis at the working level (and can be oriented along the experience lines of the previous years). (2) The retrieval of CO<sub>2</sub> from the atmosphere by means of forest protection, a **global reforestation program** and the intensification of land management.

Who is to pay for such measures? The implementation of the wildcards would cost a lot of money and the nations cannot bear this. Luckily, many actors from the **private sector** hurry to fill this gap today for **reasons of reputation**, for political ambitions, and for ethical reasons. Companies, organizations, private persons and an increasing number of actors want to position themselves in a **climatically neutral** manner. Large enterprises have already announced their climatically neutral position, just as the German land of Hesse (Hölscher, L., Radermacher, F. J., 2012), which targets climate neutrality by 2030 and which takes on a political vanguard role with regard to this topic. The important economic sector of customer brands of high value is already acting and puts pressure on its sub-suppliers under **CSR aspects**. Well-paying consumers and high-performance investors voice the respective demands towards brand manufacturers. **Hundreds of actors** are already involved in the field of **climate neutrality** today and many **millions of dollars** are activated annually for this purpose, see examples (Hölscher, L., Radermacher, F. J., 2012), (Deutsche Bahn, 2012) and (Handelsblatt, 2012). Switzerland will legally entrench the climate neutralization of its entire power generation sector. In Germany, the German chimney sweepers, the nation's lucky charms, who are experts on the environment and climate matters and visit each and every household at least once a year, have also already begun to take action (Bundesverband des Schornsteinfegerhandwerks). And the children's initiative "Plant for the Planet" has already mobilized hundreds of thousands of people on the issue and coordinated the planting of millions of trees (Finkbeiner, F., 2010). On top, the so-called Berlin Appeal (Emse, H., 2011) asks every citizen to make themselves climatically neutral.

The funding of climate neutrality through the private sector is the key to a functioning global climate regime. The annual 100 billion US dollars which are necessary for the **global climate fund**, also agreed upon in Copenhagen, which is to fund the cooperation of the North and the South in the field of climate protection, can be raised by selling certificates for decommissioning purposes. Today, nobody knows which money is to furnish the fund. The politicians' task at hand under the described approach is to establish the "anchor" part of the global climate regime according to the Copenhagen formula and then **merely** to create a platform for trade certificate (decommissioning; reforestation) which is free of risks for the reputation of the involved actors from the private sector and to "lean" with respect to bureaucratic requirements. This will not only satisfy the fairness requirements between the North and the South but also satisfy the **fairness requirements** between premium consumers and normal citizens (Chakravarty, S., Chikkatur, A., de Coninck, H., Pacala, S., Socolow, R. and Tavoni, M., 2009). The Gulf States, China and India, Mexico and Brazil already count a similar number of premium consumers as the wealthy part of the world.

## 6. "Out of the Box"

What is the new aspect of the second chance introduced for a functioning global climate regime, a chance, however, open for only 10-15 years to come and which may not be seized anyway? The governments of the world understand that they can no longer solve the climate problem on their own and not through the previously followed contractual logic. They also understand that a limitation of emission volumes alone no longer represents a sustainable



option. They understand that a stringent cap at the government level cannot be reached and that there is actually no need for such a stringent cap at the government level at all. A dynamic cap in compliance with the Copenhagen formula would suffice. This is one half of the solution. The second half is opening a “stage” for private actors such as organizations, companies and private persons who intend to position themselves in a climatically neutral manner in a way which is risk-free in terms of reputation and “lean” with respect to bureaucratic requirements. This affects the two available wildcards for achieving climate neutrality, that is to say the decommissioning of emission rights and the biological sequestration of emissions. Both wildcards are expensive and effective at the same time. The latter will withdraw CO<sub>2</sub> from the atmosphere on a large scale.

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*“We need to quickly abandon the dominating old negotiation logic and practice a new way of thinking.”*

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**CO<sub>2</sub> will become a productive resource** for new wealth, especially in some poorer parts of the world. At the same time, this allows for partnerships for climate protection between the North and the South without which the global climate problem cannot be solved anyway.

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*“Only a massive dedication of systematic intelligence will open a window for the solution of the climate problem.”*

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An airtight contract can be negotiated by 2015. A first draft of such a contract including a great variety of aspects to be considered can be found in (Radermacher, F. J., 2010). This contract could come into effect in 2020, if not earlier. If we implement large-scale reforestation day by day from today, even without a working global climate regime, then even the abundance of **additional emissions** prevailing in the meantime as a result of the global community’s inability to reach its target of negotiating a climate contract by 2012 could be neutralized.

There is still a chance to reach the 2°C target. However, even this window will close in some time since the areas for reforestation in the southern hemisphere with their 500 million hectares may be vast but not inexhaustible (World Resources Institute, 2010). For this reason, we need to get **out of the box** quickly, we need to quickly abandon the dominating old negotiation logic and practice a new way of thinking. We have maneuvered ourselves into such a precarious situation that only a massive dedication of systematic intelligence will open a window for a solution for the climate problem. Imagination and agility will become decisive resources in this matter.

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## **“BIOPOLIS”**

### **Biopolicy for Greener and More Livable Cities**

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#### **Abstract**

*Urban centers are the engines which must bear the brunt of required changes to meet climate change mitigation goals, whilst continuing to provide social and economic opportunities. Restoring nature to the city is not a luxury; it is vitally important to our health and well-being. Biopolicy can help international decision-makers find new ways for understanding the relationships between cities and their environments and how environmental burdens may be mitigated or resolved. A “biopolis” model, as proposed and supported by the principles of biopolicy, can evolve into a coordinated program of action in sustainable urban management that limits emissions, preserves and expands green spaces, protects waterways, encourages urban farming, enhances cultural development, creates green jobs and promotes educational opportunities for all.*

#### **1. Building a “Biopolis” – The Road to Climate Resilient Cities**

The biggest challenge for the 21<sup>st</sup> century will be the development of climate-efficient urban growth. With rates of urbanization increasing and per capita energy consumption on the rise, cities around the world are an important part of the climate change problem, but they can be an important part of the solution as well. For twenty eight years, the Biopolitics International Organisation (B.I.O.) has been sensitizing experts, decision-makers and the local authorities to promote new and innovative ways of achieving greener and more livable cities. Progress in this area has been extensive, and today, urban management policy is largely being developed with due concern for the environment. Moreover, green construction materials are increasingly sought after, while energy savings in buildings are promoted through renewable energy options and applications. Clean vehicles, public transportation based on alternative energy, optimum recycling, heating and cooling technology with the use of low-emissions/low polluting systems, are a few examples of technologies which are vital to the development of green cities. Partnerships between governments, community groups and the private sector have proven very useful in shaping the urban landscape of tomorrow in an environmentally responsible manner.

Cities are home to about half of the world’s population, and this proportion increases with each passing year. However, living in a modern city need not exclude experiencing the joys of nature. Cities in many countries have taken steps to restore the ambiance of natural

systems within their boundaries. They strive to become a “biopolis,” an environmentally sustainable city, in which human and natural populations can live in harmonious balance.

Restoring nature to the city is not a luxury; it is vitally important to our health and well-being. Cities must become more livable places for their human populations and more inviting for wildlife. They should capitalize on their green assets and expand the presence of natural systems found within their boundaries. They can achieve this through a coordinated program in sustainable urban management that preserves and expands green spaces, protects waterways, encourages urban farming, and develops educational opportunities for all. In addition to providing vital environmental functions, such initiatives can greatly benefit the physical and mental health of the inhabitants, not to mention the local economy and the job market. The participation and empowerment of all citizens are vital to the success of any such program.

### ***1.1 Reducing Urban Sprawl and Increasing Green Spaces***

Land development affects the demand for transportation, and the provision of transportation facilities changes how land is used. Real progress toward sustainable urban management cannot be made without addressing this interconnection. Designing communities so that the demand for transport is less, discouraging urban sprawl, and supporting more compact communities where people can move more easily from home to work, shopping, etc., are essential for achieving livable cities with enhanced quality of life for all their citizens.

All green spaces help urban areas adapt to the impact of climate change and are vital in climate change mitigation efforts. Cities developing open space plans that provide for interconnected systems of green spaces, including parks, gardens, walkways and stream corridors, can reap multiple benefits. Increasing urban green spaces can be achieved by a variety of techniques, including outright purchase of undeveloped tracts, gifts and bequests of land, laws and regulations requiring that a certain percentage of new development be retained as open space, conservation easements restricting the use of land in the future to green space, and the creation of urban farms and gardens. In addition, cities should adopt programs for continuous tree planting along boulevards, in parks and along streams. Tree species should be carefully selected for their suitability to the individual area, and consideration should be given to native species, water needs, susceptibility to disease, and other factors. Trees with minimal maintenance requirements should be preferred.

### ***1.2 Taking Advantage of Urban Waterways***

Rivers and streams are natural corridors that transect many urban areas. They provide a great opportunity for recreation, education and contact with nature. Fishing, boating, and even swimming, depending on the water quality, are common activities along urban riverbanks. Urban waterways are vital urban environmental assets that should be protected and made an integral part of the open space system of a city. Pathways should be provided along stream corridors that connect to other paths in the city’s pedestrian and open space network. Where appropriate, measures should be taken to protect wildlife, such as the enhancement of waterfowl nesting areas, while at the same time providing sites for passive, non-intrusive observation.

### **1.3 Clean Transport**

To respond to the climate change challenge, urban transport policy must contribute both to solving traffic congestion and to reducing the demand for fossil fuels. Clean vehicles and public transportation based on alternative energy and greener transport practices and policies can reduce CO<sub>2</sub> emissions and improve efficiency. In addition, an ongoing evaluation of technologies is crucial in order to make sure that policies are well fitted to growing trends and that investment is not being made on unproductive schemes.

### **1.4 Employment and Education**

Cities are areas of enhanced economic growth and opportunity. Urban areas have always created jobs, and attracted and trained talented and energetic individuals. From their origins as trading facilities to their emergence as centers of resource development and manufacturing, cities are the loci of economic activity for the majority of the world's population. Many people migrate to urban areas in search of employment and a better life, some successfully, others unsuccessfully. Some bring skills with them, but many do not. Because of this, cities have always struggled with balancing the needs of residents with the needs of the economy, especially during periods of economic downturn.

By training/re-training unemployed persons, urban communities can enhance their available human capital and promote positive economic improvement within their areas. Practical experience in the field, while making a direct difference to the community served, comes with extra benefit to the individual, as people experienced in sustainable development practices are highly employable in many economic sectors.

Furthermore, making cities adapt to climate change will require a well-trained cadre of professionals who understand the implications of climate change for urban development. City-specific educational programs about climate change in urban environments are also instrumental in achieving the mitigation of the impact of urban activities and climate development.

### **1.5 Agriculture in the City**

Urban agriculture is often viewed as a holdover from the past and a use that will eventually give way to development. This view should be re-considered however. Farming and vegetable gardens in cities are valuable assets that can be encouraged and protected through appropriate city policy that supports the existence of urban agriculture and provides for its continuance. Organic farming, which eliminates the need for pesticides, is a preferable approach for urban areas in order to protect public health.

New concepts in urban design should incorporate natural elements and better integrate humans with the environment, wildlife and greenery. As proposed by B.I.O. since 1985, an extension of the existing roof that allows plants, trees and shrubs to grow in a light-weight growing medium, can be an effective strategy to address several environmental conditions facing urban environments, including management of storm water runoff and pollution miti-

gation. In this context, algae beds can be used to reduce greenhouse gas emissions, while creating an additional feedstock for renewable fuel production.

### **1.6 New Technologies – “Smart Cities”**

Optimum recycling regimes, water management systems, heating and cooling technology with the use of low-emissions/low polluting systems, are a few examples of new technologies which are vital to the development of climate resilient cities. Furthermore, technology can radically change the way people interact with the urban environment and allow them to get more engaged in decisions about where they live, a key part of shaping zero-emission cities in the future. The challenge of fast urbanization is opening the way for the development of highly “smarter” cities, as more and more urban functions rely on emerging technologies. The differentiating factor that can make cities “smart” is the integrated use of information and communication technologies (ICT) in optimizing the flow of information among infrastructure and services such as administration, education, healthcare, public safety, real estate, transportation, and utilities.

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*“Restoring nature and culture to the city would be a great step toward the creation of a true biopolis.”*

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### **1.7 Bio-culture for Sustainable Urban Management**

Culture is an essential element of a climate-friendly city. The environment is affected by our culture, which is, in turn, shaped by the environment. Bio-culture represents a conscious effort to reach this interdependence. Aesthetic values, music, science, the arts, politics, and economics can all come together in the struggle for a better quality of life. Bio-culture in the city can provide the needed momentum and life-supporting policies to contribute to a more efficient implementation of urban policies with a vision capable of reinventing cities adapted to the challenges of the 21<sup>st</sup> century.

Partnerships between governments, community groups and the private sector have proven very useful in shaping the urban landscape of tomorrow in an environmentally responsible manner. A climate resilient city also encourages its citizens to commit to sustainable actions in the areas of transportation, energy use, recycling, water, food, health, and community education. Cities that adopt a program of sustainable management with the ultimate goal of zero emissions will reap many benefits, both now and in the future. They will become more attractive, healthful and livable places, and the cleansing of pollutants from the air and the absorption of carbon by trees will provide long-term benefits for both humans and wildlife. Restoring nature and culture to the city would be a great step toward the creation of a true biopolis.

## **2. Climate Change Mitigation Through Urban Adaptation**

Cities accommodate more than half the world’s population and account for two-thirds of energy consumption and over 60% of greenhouse-gas emissions. Productivity levels are also generally higher in metropolitan areas and the increasing trade and capital flows give rise to

increasing flows of people, goods, services and ideas. In this context, urbanization is viewed as the primary cause of many problems, including climate change, but also as the primary stage for a more sustainable development in the 21<sup>st</sup> century.

In addition to being one of the biggest development challenges of this century, climate change also offers opportunities to improve the way we plan and participate in cities, and decide on how best to manage the role of urban centers with respect to local, regional and global environmental changes. Achieving inclusive and sustainable growth in cities can help to build vital social networks, and help individual citizens and the community as a whole to be involved and productive. It is also a means for improving employment options and creating green jobs with staying power.

Urban centers are the engines which must bear the brunt of required changes to meet climate change mitigation goals, whilst continuing to provide social and economic opportunities. Moreover, in an era of globalization in which cities are inter-connected through flows of trade, technology, investment, finance, and people, new environmental burdens and scales of applicable governance are constantly evolving that require fresh perspectives from management. Together, these pressures are rendering cities all over the world more vulnerable to both natural and human-induced threats. Therefore, planning policies to help alleviate complex environmental stresses requires new ways of understanding the relationships between cities and their environment and how environmental burdens might be mitigated or resolved.

At its most basic level, the core principle of sustainable urban planning is that we should plan for a better future. Establishing a better understanding of the urban decision-making process and how the principles of sustainable development can be incorporated at each level of decision-making can maximize the opportunities afforded by urbanization. Remedies for curbing urban growth and its negative effects often lead to other problems. As a result, city leadership in partnership with civil society and the private sector is crucial in guaranteeing growth which can meet the challenge of urban sustainability.

With urban activities being the main source for CO<sub>2</sub> emissions, the choices made by urban centers over the next few decades will play a crucial role in determining worldwide greenhouse gas emissions and natural resource depletion. Cities consume 60% to 80% of the world's energy production, and with the urban population of the developing world projected to reach more than 5 billion by 2050, ideas about how to combine urbanization and sustainability are of a critical and urgent nature.

Although climate change has become increasingly prominent on the international development agenda, historically the focus has been on the effects it has on the rural environment and agricultural production. This is slowly changing, as urban populations are likely to be among those most severely affected by future climate change, being especially vulnerable to changes associated with warming temperatures. Many of the world's growing urban areas, especially in developing countries, will likely suffer disproportionately from the impacts of a changing climate. Major cities are at risk of flooding from rising sea levels. Heat-trapping

urban landscapes – buildings and paved surfaces – can raise the temperatures and lower the air quality dangerously through the urban heat island effect. In cities of the developing world, one out of every three people lives in slums, making them particularly vulnerable to the health and environmental risks posed by climate change. Also, climate change may worsen access to basic urban services and compromise urban livelihoods.

Low-carbon emissions and low pollution levels are essential components of quality of life in cities. Better urban planning and policies can reduce energy use and greenhouse gas emissions and improve the resilience of urban infrastructure to climate change, thus shaping future trends. Competitive cities that are eager to attract human and financial capital in order to enhance jobs and prosperity need to curb air pollution and ensure a healthy environment. Energy-efficient housing, measures to reduce traffic and vehicle emissions and to promote non-motorized transport, contribute directly to the reduction of CO<sub>2</sub>. Cutting emissions will also reduce local pollution from industries and transport, thus improving urban air quality and the health of city dwellers.

Significant action by cities on climate change will have positive economic returns in the future. Making cities adapt to the effects of climate change requires a commitment from city governments to allocate and invest resources in infrastructure and technology. Such a commitment may be hard to conceive in situations where resources are scarce at the local level, and other needs require urgent attention. However, action on renewable energy and energy efficiency in cities can significantly reduce municipal service operating costs and has enormous long-term benefits, as much of what needs to be done to reduce risks from climate change also reduces other risks. For instance, better drainage systems protect health and reduce risks of flooding, and good healthcare systems can support disaster preparedness and rapid post-disaster response.

The concentration of people and production in cities facilitates the creation of increased employment opportunities through actions to keep down energy requirements and support waste reduction and recycling. Modest adjustments to investment by choosing low-carbon technologies can, over time, bring much lower greenhouse gas emissions, even in cities with booming economies. Such adaptation does not require additional government spending, but is achieved by changing regulatory frameworks that influence individual, household, community, corporate and public investments (adjustments to building regulations, land use plans, pollution control, waste management, etc.). Some indicative actions, which are also sources of green jobs, may include:

- increasing the energy efficiency of urban infrastructure such as buildings and transportation systems
- using resources more effectively, i.e., through advanced waste and water management regimes
- producing clean energy at the district-level, as well as sourcing clean energy from large-scale suppliers
- encouraging and engaging all citizens in climate change efforts and making them aware of the consequences of climate change



It is up to high-income nations to show how a transformation to sustainable urbanization can be combined with high living standards. However, urgent action is also needed in the urban areas of low-income and middle-income countries, both through mitigation to curb greenhouse gas emissions, and adaptation to the serious risks that climate change brings. Each city shares challenges and has unique needs. Finding smart and efficient ways to provide for more people with fewer resources will make cities more resilient to climate change and reduce drastic environmental changes.

### **3. Zero-carbon Urban Networks**

Climate protection essentially means addressing local problems in a way that significantly improves efficiency and prudence in the use of energy and natural resources. Many campaigns and initiatives are enhancing international efforts to curb greenhouse gas emissions by implementing measures at the local level in the transportation, energy, building and waste sectors. These measures call for integrated and collaborative planning and management regimes to transform conventional urban areas into environmentally sustainable districts based on a cyclical urban metabolism. Furthermore, these actions are instrumental in protecting urban environments and slowing global warming, and can ultimately lead to zero-carbon urban networks with virtually no carbon footprint.

Zero-carbon urban networks served by renewable energy are emerging increasingly in France for heating homes and commercial units. In the U.S.A., the city of Dallas, Texas, derives 40% of its urban electricity supply from renewable energy sources, and approximately 76,750 employees are involved in energy efficiency services, including lighting, heating and cooling, transport regulation systems, personnel and site protection. In Salt Lake City, Utah, municipal operations have reduced greenhouse gas emissions by 31% since 2001, well below the targets of the Kyoto Protocol. Over 20% of the electricity used at the City-County Building is from renewable wind energy that does not contribute to global warming. The city also encourages its citizens to commit to sustainable actions in the areas of transportation, energy use, recycling, water, food, health, and community education.

Barcelona, Spain, has installed a district heating and cooling network which engages 65,900 employees in the water management and waste sectors, who offer services in consultancy, water treatment plants and infrastructure, water cycle management, waste services, recovery, recycling and remediation. Amman, Jordan, recently constructed a wastewater treatment plant for 2.2 million inhabitants that is 95% self-sufficient in energy.

District heating is also widely implemented in Sweden, where strict environmental legislation guides public authorities to cooperate with the private sector in the creation of green cities. In this context, an initiative themed SymbioCity was launched by the Swedish Government in 2008 to promote collaboration between the Swedish government and the Swedish industrial sector in the creation of circular, carbon neutral systems. By 2009, the initiative had created business opportunities worth the equivalent of SEK 2.6 billion. It was assessed that employment for Swedish environmental technology companies could increase by 8% annually.

An ambitious plan is under way to make Perth the world's first geothermally cooled city with the goal of achieving zero emissions under a new \$20 million Australian Government-funded project which involves CSIRO, Australia's national science agency, and The University of Western Australia. To achieve this goal the project is aiming to develop a geothermal solution to meet the cooling needs of the new Pawsey Centre supercomputer, one of the world's most powerful computers. The project will significantly reduce water use through direct cooling with groundwater and thereby save over 38 million liters of water each year compared to the standard cooling tower solution.

In China, Hong Kong boasts large modern landfill facilities with biogas recovery and on-site use, while a circular economy is generated from recycling sludge in Shanghai. Energy recovery is achieved using drying technology and the dry sludge is subsequently used as a combustible at a local power plant. The whole procedure, which serves 610,000 inhabitants, is carbon-neutral.

In Tehran, the capital of Iran, the preservation of non-renewable energy resources and efforts to use clean energy are among the most important issues the local administration has paid attention to. "Energy garden parks" have been established and solar cells have been placed on over 100 buses, 1000 traffic lights, 100 flyovers and other urban infrastructure. Large garden parks offer extensive green recreational spaces, while most highways are flanked by hillsides of green. A 70-hectare military base was turned into a park with recreational and sports facilities. Furthermore, 250 km of cycling track has been set up.

Climate change is an important issue to the citizens of Sønderborg in Denmark. The city is dedicated to creating and demonstrating new solutions, robust measurable CO<sub>2</sub> reductions, new green jobs and a talented generation of young people before 2029. A public-private partnership – Project Zero – was created to inspire and drive Sønderborg's conversion into a zero-carbon community, based on improved energy efficiency, conversion of energy sources into renewables and by uniting all of the area's stakeholders to reach a clear goal: carbon-neutral growth and sustainable urban development. Residents are collaborating on new green investments, while farmers are erecting their own wind turbines, demonstrating broad support for the Project Zero vision.

Energy-efficient technology is scattered throughout the German city of Freiburg, from the Strandbad swimming pool, which is heated with solar energy, to the university's clinic, which uses solar technology for cooling. Solar energy cells appear on many building facades and solar thermal tanks line the rooftops. The clustering of solar manufacturing firms, research institutes and policies for deployment in commercial, industrial and residential buildings earned Freiburg the nickname, the "Solar Region of Germany." In Vauban, a neighborhood on the outskirts of the town, 2,000 newly built environmentally friendly homes are located, including a 50-home solar village project that feeds more power into the grid than it uses. A nearby development incorporates a biomass heat and power plant that uses only 15% of the energy required by other homes in the city. In fact, Germany's low carbon framework explains why several other cities are leaders in energy efficiency. For example, Hamburg has also adopted its own strict climate action plans that support development of more efficient and technologically sophisticated buildings and transport networks.

## **4. Clean Energy Transforms the Transport Sector**

The contribution of transportation to global emissions is 13%, and spurs climate change, releasing pollution and greenhouse gases into the atmosphere.<sup>1</sup> It is also a main source of noise and vibration. The air quality in most cities worldwide is poor as a result of vehicular traffic and represents a threat to human health. The construction and operation of highways and transit systems disrupt biotic habitats, pollute the water and permanently alter the landscape.<sup>2</sup> If our transportation patterns continue in the “business-as-usual” path, the global vehicle fleet will have reached 2 to 3 billion by 2050.<sup>3, 4</sup>

The possibilities of the use of clean and renewable energy in the transport sector are endless. The broad range of prototype fuel cell and hydrogen developments currently taking place is creating a new concept of car technology that has led to better functioning electric automobiles with no noise pollution and no exhaust gases. In the effort to reduce CO<sub>2</sub> emissions and improve efficiency, more innovative technologies have allowed a wider use of fuels and power sources and also the combination of more than one propulsion technique for a vehicle. Soon, conventional modes of transportation will be almost fully replaced by electric vehicles. These developments will lead to a greater and wider use of hydrogen cells, which are quickly becoming the wave of the future and resulting in new areas of research and development.

The efficient provision of transport services is crucial for this effort to succeed. To effectively respond to the climate change challenge, transport policy must contribute both to solving traffic congestion and to reducing the demand for fossil fuels. In addition, an ongoing evaluation of technologies is crucial in order to make sure that policies are well fitted to growing trends and that investment is not being made on unproductive schemes. This kind of analysis should be performed along with broader cost benefit analyses, taking into account environmental, social and economic benefits. The side effects of policies should also be carefully assessed, so that policies do not result in harmful outcomes.

Governments may have a role to play in supporting commercialization of innovative car technologies and fuels. New business models and ideas are important for the diffusion of green cars, so encouraging venture capital investments may be a fruitful possibility. Programs in support of the commercialization of eco-innovations have had mostly positive outcomes in terms of private fund mobilization and employment creation, although some concerns about management and effectiveness have been raised.

## **5. Urban Agriculture – Resilient Urban Food Systems**

Across the globe, urban farms that provide fresh, local produce to city dwellers and create jobs for their communities are steadily thriving. An urban agriculture movement has been quietly gaining momentum for several decades, in the developed and developing worlds alike, evolving out of the need to address such pressing issues as food sustainability and security, urban population growth, year-round crop production, a safe and varied food supply, farmland and forest land loss due to development, creative use of wastelands in urban areas, and recycling of food wastes in cities. With city growth pushing cultivation land further and

further from city centers, urban agriculture also becomes more and more sensible because it can avoid the increasing costs of transport, packing and refrigeration and the losses of produce.

As a result of this spreading movement, poor urban populations have been encouraged to grow their own food in their own neighborhoods with impressive outcomes: urban farms have turned empty sites and abandoned lots of inner city neighborhoods into productive oases that contribute to sustainable urban development, and help to bring in income and improve local diets. For example, in Peru, small urban farms located in the poorest slums in Lima provide food security and food safety for some of the most vulnerable urban communities. There are currently over 100 urban farmers in Lima, 83 of whom grow vegetables, 52 raise small animals, 45 grow fruit trees, 31 grow aromatic herbs and 18 produce ornamental plants.

Employment potential also increases as several work opportunities arise in helping urban farmers to improve soil qualities and water sequestration and conservation techniques, which require specific skills. Value-added products and approaches for tapping new markets can be created in the process and become a source for new employment. Educational curricula can also be developed and implemented, especially in cases where urban farms are located near schools or educational and/or training centers.

Horticulture, the branch of agriculture concerned with intensively cultivated plants, supplements urban agriculture and has been shown to empower the urban poor, contributing to their food security and nutrition. It also helps to make the city greener and to enhance social and environmental resilience, from slum improvement and waste management, to an increase in employment and community development. To support horticulture and urban agriculture, especially in developing countries, the FAO has helped direct multidisciplinary projects in cities to improve policies and institutional frameworks. These projects include the promotion of irrigated commercial gardening at urban peripheries, hydroponic micro-gardens in slum areas and green rooftops in city centers.

But even in the developed world, urban farmers have been receiving land, training, financial support, supplies, and even compost from municipalities and NGOs to establish urban farms. In many cities in the U.S.A., for instance, sites designated for urban agriculture are able to receive protective status from the onslaught of developers anxious to turn them into high-priced developments, making them evolve into lucrative businesses. The Red Hook Farm, in the city of Brooklyn in New York, started by a local youth group in 2003 on an abandoned asphalt ball field, sold more than US\$ 25,000 of produce by 2007. Another urban farm in Philadelphia took in some US\$ 67,000 from its production of carrots, lettuce and radishes, while the Growing Power NGO in Milwaukee sold over US\$ 220,000 worth of lettuces, winter greens, sprouts and fish to commercial enterprises and consumers. These successful organizations are helped not only by land and financial support; training has proven equally important to get these projects going, making the idea of urban farming particularly suitable for the unemployed. This training includes many aspects, from how to run an urban farm to organic farming methods. There is even a formal sixth-month training program available at the Center for Agroecology and Sustainable Food Systems in the state of California which urban farmers throughout the U.S.A. can attend.

Similarly in Europe, urban agriculture has been making promising inroads. In the metropolitan area of Delft in the Netherlands, effective and integrated land use policies have led to the creation of a unique organic farm on the outskirts of the town that has been providing not only healthy produce but also a recreational outpost and educational resource for a decade, while over 800 hectares of public land in London were already being used for gardening by the turn of the century both within the urban area and on its outskirts.

Asian countries have also seen a rise in urban agriculture. In and around the capital city of Vietnam, Hanoi, more than 150,000 tons of fruits and vegetables are produced each year. China has been including food production into its city plans since the 1960s and today receives more than half of its vegetable supply from its own market gardens, which are cheaper than trucking them in from distant sources. In Beijing, a growing number of urban farms have helped double the income of local farmers and improve the nutrition of the local populace. In Shanghai, 60% of vegetables, 100% of milk, 90% of eggs and 50% of pork and poultry come from urban and peri-urban areas.

In many regions of Africa, urban agriculture is extensively applied for the reduction of poverty and food insecurity, and the enhancement of urban environmental management. In the 1990s, urban agriculture in Nairobi offered the greatest self-empowerment earnings for small-scale enterprises and the third highest profits for urban Kenya. Correspondingly, Dakar, the capital and largest city of Senegal, is responsible for 60% of vegetable and 65% of poultry production nationally, while in Accra, Ghana, 90% of the city's fresh vegetable consumption is from production within the city. In the Democratic Republic of Congo, the FAO has helped devise measures regulating 1,600 ha of garden space to be operated by 20,000 full-time growers in five cities, introducing improved vegetable varieties and upgraded irrigation structures which extend water availability year round. To ensure safety and quality of production, 450 growers' associations were trained in good practices with organic fertilizers and bio-pesticides. In Kinshasa, 75,000 to 85,000 tons of vegetables, or 65% of the city's supply, come from market gardens.

Next to food security, local economic development and poverty alleviation, the environmental implications of urban agriculture and horticulture are also vital, as many environmental problems that accompany urbanization may be tackled with urban farming. Bogotá, Colombia, and Sao Paulo, Brazil, have benefited immensely from the improved soil structure and porosity caused by urban gardens, avoiding landslides and flooding. Urban agriculture can also help the "greening" of a city, by turning unattractive, abandoned open spaces, which are often used as garbage dumps, into green zones with positive micro-climate effects, including cooling and carbon sequestration. Many municipalities on Peru's arid coast were made "green" with the help of urban agriculture.

An exploration of the possible role of urban agriculture in future megacities is carried out in Casablanca, Morocco. Given the highly varied landscape of the urban area and the complex nature of the project, a multi-strategic approach is followed with the use of several specific goals pursued in a variety of ways. The key directives are to raise awareness about urban agriculture, begin implementing it and evaluating how it works and how it can be

improved in various contexts while observing what benefits it has for issues of sustainability and poverty alleviation in the city.

Urban agriculture is a powerful means for social integration as well. Disadvantaged groups, such as orphans, the elderly and the unemployed, have been involved in urban agriculture programs set up by NGOs or municipalities which are aimed at helping them integrate into the urban fabric and improve their livelihoods. Participants may feel enriched and empowered by these community projects in addition to the benefits reaped nutritionally and economically. In developed countries, the aesthetic and recreational aspects (recreational routes, fresh food educational functions, animal contact) of urban and peri-urban farms may play a bigger role in the promotion of urban agriculture. Indeed, with cities throughout the world already producing one-third of the food for local consumption, this trend is likely to continue as urban residents realize the dietary, economic, environmental and social benefits of growing their own food.

## 6. Zero-emission Cities Generate Employment

In view of climate change mitigation, cities around the world are re-examining their urban assets in terms of competitiveness, vibrancy and quality of life. Cities need to plan for the longer term to manage waste and conserve resources in order to be environmentally sustainable, socially progressive and economically competitive. Good governance and institutional frameworks are fundamental to sustainable urban management.

The goal of zero-emission cities has the potential to drive the development of new technologies and business opportunities. Development policies that fully harness the benefits of natural systems and protect and nurture these assets for future generations can enable local governments to lead an urban renewal process that delivers significant benefits, both economically and socially, and caters to the needs and priorities of key stakeholders.

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*“Sustainability can become established only when the mentality throughout the entire developmental process changes.”*

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Cities everywhere are seeing the changes ahead, as well as the opportunities and commercial benefits associated with early action for climate change mitigation, such as the transition to a low-emissions economy. This recognition is already driving a range of employment opportunities across industries and services, such as the creation and implementation of alternative technologies and products, more efficient logistics and production processes, and associated services for better urban development.

Solutions addressing climate change strengthen community development, increase the livability of cities, improve the well-being of citizens and create green jobs. Green jobs can be found across traditional and new sectors, as many urban services make climate-smart improvements in their operations. Environmentally sound urban practices save money from reduced waste disposal and energy costs, create shared value and improve productivity through better environmental performance. Green jobs can result from the creation of new



employment opportunities or from the transformation of existing jobs through the upgradation of skills, and through organizations that green their existing practices to meet the growing demands of creative urban development.

Increasing transportation alternatives, reducing infrastructure costs, creating more affordable housing, improving air quality, preserving natural and cultural resources, and restoring local economic and social vitality are just some of the approaches for creative urban development. The building sector can make a substantial contribution to a sustainable world, but sustainability can become established only when the mentality throughout the entire developmental process changes. Cities that are not livable places are not likely to perform important economic functions in the future.

Green job programs are rapidly becoming high-profile centerpieces of many cities' environmental and economic development agendas. An example is set by the city of Vancouver in Canada, which has approximately 14,900 green jobs in eight sectors, based on numbers and surveys from March 2010 and April 2011. These jobs make up for more than 3% of the total jobs in the city. Indicative green jobs include, but are not limited to, green development officers, energy advisors, green funds managers, carbon offset aggregators, ICT networking specialists, smart grid engineers and technicians, smart meter manufacturers, industry association directors, green purchasing managers, policy analysts and researchers, and sustainability educators.

New York City has also launched several long-term sustainability initiatives to expand green jobs citywide. PlaNYC 2030 is a program created in 2007 which comprises 127 initiatives with 10 major goals, ranging from a 10-minute walk to a park to achieving the cleanest air quality of any big city in the U.S.A., in order to meet the goal of reducing citywide greenhouse gas emissions by 30% by 2030. Attempts to meet these goals create opportunities in many green employment fields, including building retrofits, urban forestry, renewable energy and storm water management, resulting in a 10-year planned investment of almost US\$1 billion in municipal retrofits and new technologies.

Addressing the diverse aspects of urban environmental challenges will continue to be an aspiration and vision for many urban planners worldwide. Economically viable zero-emission communities can evolve from critical collaborations between developers and their city government counterparts, and foster urban development that improves the local environment and quality of life, and creates jobs. Such communities are underway in Melbourne and Sydney, Australia, in Palhoça and São Paulo, Brazil, in Toronto and Victoria, Canada, in Ahmedabad and Jaipur, India, outside Panama City, Panama, in Pretoria, South Africa, in Seoul, South Korea, in Stockholm, Sweden, in Sonderborg, Denmark, in London, U.K., and in San Francisco and Oberlin, in the U.S.A.

Information and educational resources should also become available to all citizens as tools for understanding and appreciating what it means to live sustainably and to become motivated to act as stewards of a sustainable city. Integrating environmental dynamics with urban systems must be viewed as a challenge and opportunity in helping cities contribute to sustainability. All these actions can serve as an inspiration and guide to communities around



the world that want to participate in the effort to reverse global warming and environmental degradation, while creating new sources of employment.

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## Book Review –The Climate Bonus: Co-benefits of Climate Policy

*Alison Smith* (UK). London & NY: Earthscan/Routledge, Jan 2013, 408p, \$59.95pb.

**Review by Michael Marien**

Director, Global Foresight Books;  
Fellow, World Academy of Art and Science

For several decades, we have heard, over and over, that climate change is a very bad development, and that addressing climate change and evolving to a sustainable or low-carbon society are a necessary response—seemingly painful in the short term, desirable in the long-term however. But how desirable?

Smith, an environmental policy consultant to the UK government and the EC, who has been a lead author for the IPCC, provides a detailed, systematic overview of the many benefits of a green economy, concluding that *“Far from being a burden on society, tackling climate change presents us with an opportunity to move to a cleaner, safer and healthier world.”* (p.334)

The climate debate has polarized into one of the pressing immediate economic needs vs. the long-term, uncertain, and largely invisible threats of climate change that are easy to ignore. *“Yet this misses the bigger picture. Low-carbon policies often provide a whole range of additional environmental, social, and economic benefits. These often-overlooked co-benefits can help to offset the financial cost of the technology and boost its political acceptability...*

*Many of these benefits are far more immediate and visible than the impacts of climate change, and can provide a much stronger motivation for supporting the move to a low-carbon society. For many low-carbon policies, we might argue that the co-benefits alone would justify their adoption even if climate change did not pose a threat.”* (p.2)

Great progress has been made in reducing air pollution over recent decades, but these technical advances have been partly offset by the rapid growth in vehicle use and electricity demand, such that “air pollution limits are still being exceeded.” Many of the co-benefits of climate policy are linked to reducing use of fossil fuels. The *main policies* for cutting the climate impacts of fossil fuels are 1) improving energy efficiency and promoting energy-saving behavior; 2) switching to low-carbon energy sources such as renewable energy and nuclear power, or switching from high-carbon coal to medium-carbon gas; 3) reducing methane emissions from coal mines and oilfields by collecting the gas and using it instead; 4) reducing waste of materials by re-use and re-cycling; 5) carbon capture and storage; 6) geo-engineering to reflect sunlight. The first four options give rise to three major sets of co-benefits: cleaner air, safer and cleaner energy, and energy security (which reduce risks of price spikes, supply disruption, and conflict).

Six chapters enumerate the many co-benefits, while also discussing conflicts and “the way forward.”

1. **Cleaner Air: Cutting Pollution.** Co-benefits for health, ecosystems, and the economy include: 1) lower incidence of premature death and illness from heart and lung diseases and cancer; 2) lower health costs; 3) less work time lost due to pollution-related illness; 4) healthier forests, streams, lakes, and other ecosystems; 5) reduced damage to buildings from acid rain and soot; 6) increased crop yields due to reduced ozone concentrations; 7) cost savings of installing and operating pollution control equipment.

Air quality benefits offset much of the climate policy cost, and can even exceed it. However, policies to address climate change and air quality have been separate: air quality has typically been the responsibility of local or regional governments, while climate change is a global issue. “There is an urgent need for a more integrated strategy to maximize the synergies and minimize the conflicts between the two goals.” Twelve “win-win options” good for both climate and air quality are listed.

2. **Greener Land: Forests, Food, and Farming.** Better land management is essential to meet climate targets. Deforestation and agriculture account for about 24% of GHGs, yet with best practice both could be carbon-neutral by 2030. Co-benefits include: 1) protecting biodiversity, which is currently declining at an alarming rate (the main driver of this decline is habitat loss); 2) water catchment, flood protection, and soil protection (trees perform a vital function in stabilizing soil, providing clean water, and preventing floods); 3) reduced air pollution from forest fires (the risk of fires increases significantly when forests become degraded, leading to lost tourism revenue, healthcare costs, more carbon emissions, etc.); 4) preserving livelihoods for indigenous people and workers in the forestry sector; 5) preserving ecosystem services to poor communities (estimated at >\$1 trillion per year); 6) preserving aesthetic, cultural, and spiritual values of forests; 7) reducing soil erosion, as well as air and water pollution; 8) improving farm incomes by cutting fertilizer costs, boosting yields, and enhancing resilience to climate change (by adding organic matter to soils or leguminous cover crops, and conservation tillage); 9) agroforestry (planting trees and shrubs) can diversify and improve farm incomes.

Badly-designed policies, however, can undermine the co-benefits or even make the situation worse, e.g. support for biofuels can lead to clearing natural habitats, and payments for forest carbon can lead to land grabs, corruption, and fraud. The way forward is to expand protected areas (some 14% of forests are currently protected—in theory), put an economic value on forest carbon through a well-designed REDD system (Reduced Emissions from Deforestation and forest Degradation), cut perverse subsidies, curb rising demand for paper and timber, clarify ownership of forests and improve governance, support certification schemes (promoting sustainable timber, paper, and food), reduce emissions from nitrogen fertilizers and methane, eat less meat and dairy products, and increase carbon in agricultural soils by burying biochar and by integrated pest management.

3. ***Secure and Safe Energy: Adapting to Peak Oil.*** Dependence on fossil fuels poses risks for energy security. There is a consensus that we face a future of rising oil prices, more frequent supply disruptions, and escalating oil-related conflict. The “drill, baby, drill” approach to energy security, including exploitation of shale gas, will not prevent dangerous climate change. Gas supplies are more secure than oil supplies, but “Peak Gas may be closer than we think” (p.121) because data on gas reserves are less reliable than for oil reserves.

The co-benefits of a strategy based on cutting energy consumption and waste, and shifting to low-carbon energy: 1) more secure energy (fewer blackouts and brownouts; reduced rationing, long queues, and steep price increases); 2) more affordable energy (lower prices in the long term), cheaper energy services, better price stability; 3) safer and cleaner energy (reduced risk of oil spills, coal mine accidents, and ecosystem damage from fossil fuel extraction); 4) reduced use of water for fracking shale gas (about ten times more than the quantity used for conventional drilling); 5) clean energy access for all (1.3 billion people still have no access to electricity, and 2.7 billion people rely on traditional biomass for cooking); 6) switching to shale gas will not keep us within safe climate targets, and displaces development of renewable energy; 7) “total coal production could peak between 2020 and 2050” (p.123); 8) “peak uranium” is possible: the best reserves are becoming depleted and rising demand for nuclear power could lead to a major risk of short-term supply shortages.

4. ***Less Waste: A Resource-Efficient Economy.*** Material efficiency is just as important as energy efficiency, because over half of GHGs come from making material goods such as houses, cars, food, clothing, and appliances. We can choose low-impact materials, cut waste, minimize packaging, and increase recycling, reuse, and repair.

The co-benefits: 1) avoiding resource-related conflict and instability; 2) reducing impacts of extracting and processing resources (e.g., pollution, landscape danger); 3) reducing costs and impacts of waste disposal in landfill sites and incinerators; 4) saving money for households by improving the durability of goods and reducing food waste; 5) making businesses more competitive by saving money on materials, water, energy, and waste disposal; 6) conserving scarce resources as we face possible “Peak Minerals” and increasing cost of extraction.

A consensus is emerging on several priority areas: the growing problem of electronic waste, construction materials (the bulk of waste in most countries), food waste (large amounts of food are wasted due to storage problems and wasteful consumer habits; cutting this waste can alleviate a wide range of problems such as use of land, water, fertilizers, and energy), eco-design of products and processes, etc.

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*“To facilitate the transition to a low-carbon economy, new economic thinking is needed that expands the definition of progress and well-being beyond the GDP measure.”*

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5. ***A Stronger Economy: Long-term Stability and Prosperity.*** For most of the 20<sup>th</sup> century, the economy and the environment were seen as being in conflict. “This old view of climate policy as an economic burden is giving way to a new vision of a dynamic, prosperous green economy” (p.222). Co-benefits include: 1) more jobs because low-carbon businesses are often more labor-intensive (fear of job losses has been a major barrier to climate action); “compared to fossil fuels, renewable energy creates more jobs per dollar invested, per unit of installed capacity, and per unit of power generated” (p.227); 2) cost savings to households and businesses (likely to become more important as prices for energy, materials, food, and water continue to rise); 3) a low-carbon future will encourage rapid introduction of smart, clean, and efficient technologies; 4) protection from resource price shocks and shortages, which lead to economic and social instability.

To facilitate the transition to a low-carbon economy, new economic thinking is needed that expands the definition of progress and well-being beyond the GDP measure. Alternatives to GDP are briefly discussed (p.277). “Because of our fixation on growth as the means to solve all problems, we have not even started to discuss and research the best method of adapting our economy to fit within the ecological limits of the planet” (p.279). Conventional economists have avoided debate, and “lack of debate is in fact the main obstacle to achievement of a prosperous low-carbon economy” (p.282).

6. ***Health and Well-Being: Benefits of a Low-Carbon Lifestyle.*** Active travel (walking, cycling), a low-carbon diet, and less materialistic lifestyles can mitigate public health problems related to physical inactivity, poor diet, and stress. Co-benefits include: 1) health and fitness (1 billion people eat too much or too much of the wrong type of food and are physically inactive; low-carbon diets tend to be healthier); 2) walking and cycling can lead to safer and quieter streets; 3) shifting toward shorter working hours (rather than more material consumption) can reduce unemployment, redress the work-life balance, and improve community cohesion.

The way forward involves promoting lifestyle changes (to make sustainable behavior easy, cheap, and attractive compared to the alternatives), encouraging low-impact diets, enabling sustainable travel choices, and highlighting the benefits for well-being of a less materialistic lifestyle.

## Conclusion

“For too long, governments have looked at climate change in isolation, failing to consider the impacts of climate policy on other areas and missing the co-benefits and conflicts” (p.322). To reap the full benefits of *The Climate Bonus*, we must look at the big picture and integrate it fully with other concerns such as energy security. “We need to take all the co-benefits and conflicts of different policy options into account, and set up an integrated policy framework” (p.325). This is illustrated with two visions of the future: one in which we continue with isolated policy initiatives and fossil fuel lock-in (business as usual), and one in which we move to joined up policies for a green economy, after listening to scientific advice on safe levels of greenhouse gas emissions. In this scenario, carbon emissions by 2050 are

reduced to the point where the worst impacts of climate change have been avoided, and the natural world is thriving, with vibrant forests, clean air and water, and abundant wildlife. Total costs of a strong and coordinated climate policy are affordable (about 2% of GDP) and are outweighed by the co-benefits.

## COMMENT

Many books have been published on sustainability; this one is different because of its strong positive focus on “the climate bonus.” It is an excellent example of the much-needed integrative thinking, identifying some 37 overlapping and reinforcing co-benefits in six major categories: cleaner air, greener land, safe and secure energy, less waste, stronger economy, and improved lifestyle. Many of these arguments for sustainability have been made extensively, but in relatively piecemeal fashion and without the emphasis on positive co-benefits, as well as conflicts and cautious ways forward. This synthesis is backed up with some 450 references, including recent thinking by OECD (e.g., *Towards Green Growth*; GFB Book of the Month, August 2011), the International Energy Agency, the World Bank (e.g., *A Smarter GNP: Factoring Natural Capital into Economic Decision-Making*), and the UNEP’s 2011 report *Towards a Green Economy*.

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*“Diversity is often a strength, but too many fragmented approaches to promoting sustainability may weaken progress in realizing this necessary and desirable transition.”*

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The 37 co-benefits, taken together, make a powerful case for sensible climate-relevant policies. The major problem, however, is that this encyclopedic work is difficult to digest and communicate, compounded by the \$59.95 price which will deter many would-be users. The message of many attractive co-benefits needs to be widely disseminated in a number of ways so that it enters general political discourse, with this book ideally serving as a foundation. A more popularized version of this message, for example, is James Gustav Speth, **America the Possible: Manifesto for a New Economy** (Yale University Press, Sept 2012, 272p; brief version in *Solutions* journal, 4:1, April 2013). Also see the Worldwatch Institute, **State of the World 2013: Is Sustainability Still Possible?** (Island Press, April 2013, 441p), with 34 chapters on getting to sustainability—but without Smith’s focus on co-benefits.

Diversity is often a strength, but too many fragmented approaches to promoting sustainability may weaken progress in realizing this necessary and desirable transition.

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