

take something that seemingly works inherently against green energy and put it behind the cause. So involving big business interests in Europe, and especially in the Maghreb, will possibly increase the DII's likelihood for success. Through NEAL, Algeria has been working on receiving foreign investment in the area of solar power since 2003, and have continuously partnered with the US and the EU to develop strategies to make renewable energy projects happen in the Maghreb. The US-Algeria Energy Forum of 2009 was focused on the topic of renewable energy development in Algeria, and about highlighting roles that the US can play in investment in sustainable energy projects⁴⁸.

CONCLUSION

The Desertec Industrial Initiative is an ambitious venture in terms of scale and monetary investment. There exist numerous criticisms of the project, but in this analysis it has been demonstrated that many of these criticisms do not hold true under careful investigation. At first glance it seems that the project is too expensive, too risky, and not politically viable, but it can be demonstrated that this project actually does have some prospect for success and could even create some positive spin-off effects, such as the beginning of an EU-MENA Smart-grid. In order to meet the commitments that Europe has made it will have to develop an arrangement to generate more of its consumed electricity from sustainable sources. This goal might be partially achieved through Saharan solar power energy projects such as the DII. The mitigation of climate change demands change, and it demands it soon, so Europe should start thinking 'big' about its move toward sustainable energy, and support large scale transitions to renewable electricity use. The progress made during the current feasibility study will likely dictate whether the DII will come to fruition, and for the sake of the climate, let us hope that the private sector begins paving the way to a more sustainable status-quo for Europe and North Africa.

Freedom to Develop

Free/Open Source Software in the Developing World

Jean-Francois Arseneau

YouTube, Facebook, Google, Microsoft Word and the dreaded PowerPoint presentations: technology has become ubiquitous in our post-industrial lives. Students wander around their university campuses with laptops while office workers remain glued in front of their computer monitors for their entire workday, sipping coffee while filling out endless spreadsheets. This has become the landscape of what is often termed the "Information Age." However, often left out of the story of the information age are the developing countries, most of which manufacture the parts that make up the backbone of our worldwide information technology infrastructures. For reasons of costs and even issues such as lack of localization, developing countries are not always able to benefit from the same unlimited access to information technology than users in the developed world can enjoy.

More pertinent to governments is the inability of developing world start-ups to penetrate a software market dominated by corporations in the developed world who have access to resources that can, for example in the case of Microsoft, even outstrip the funds of their entire country. Having to compete with such powerful competitors is not an easy challenge. It becomes even harder to compete when software products are usually widely pirated with impunity in developing countries. Any attempt to create a domestic software industry has to simultaneously be able to innovate with the limited resources available to them, be staffed with programmers who could have been brilliant but rarely have had access to the best training, and cope with the reality that the more lucrative markets are usually in the developed world where native products have more ready access to market.

⁴⁸ US-Algeria Business Council. 2009. www.us-algeria.org

Here is where Open Source steps in. Using the capacity for software to be replicated in an unlimited amount for virtually no cost, the open source movement radically changes the way in which software is developed by opening up the source code to everyone and allowing anyone to work on the software. This new way of developing software opens the door for developing countries to leapfrog into the latest of software technology and programming methods and gives programmers in developing countries access to a global community, free of charge. This essay first briefly explains what Free/Open Source Software (FOSS) is and its origins. It then looks at some of the reasons why developing countries would want to adopt FOSS and how it can be an engine of economic and national development.

FREE/OPEN SOURCE SOFTWARE?

Free Software was born out of a culture clash between hacker culture and corporate culture. In 1971, Richard Stallman and other programmers were working in the MIT AI Lab and within this community they shared code amongst themselves.¹ But as the technology developed, most of the hackers, as Richard Stallman likes to call himself and the others at the MIT AI Lab,² were hired by a spin-off company called Symbolics, splitting their community. The MIT AI Lab then purchased new machines that came with conditions restricting the use of their built-in operating systems: non-disclosure agreements.³ As Stallman recounts, "This meant that the first step in using a computer was to promise not to help your neighbor. A cooperating community was forbidden. The rule made by the owners of proprietary software was, 'If you share with your neighbor, you are a pirate. If you want any changes, beg us to make them.'"⁴ This threw Stallman into a moral debate in which

he concluded that he could not stand by such a restrictive framework. In 1984 he quit the MIT AI Lab to start the GNU Project, a free clone of the Unix operating system; GNU standing for the recursive acronym (a hacker tradition) GNU's Not Unix.⁵ The project was *copylefted*, meaning that it is licensed under a Free Software license called GPL (General Public License) that stated:

- You have the freedom to run the program, for any purpose.
- You have the freedom to modify the program to suit your needs. (To make this freedom effective in practice, you must have access to the source code, since making changes in a program without having the source code is exceedingly difficult.)
- You have the freedom to redistribute copies, either gratis or for a fee.
- You have the freedom to distribute modified versions of the program, so that the community can benefit from your improvements.⁶

From there, the Free Software movement has grown into a diverse and worldwide community.

OPEN SOURCE IN DEVELOPING COUNTRIES

One of the realities of the spread of FOSS is that it has become a viable alternative to many proprietary technologies. Linux is now a popular alternative to Microsoft Windows, OpenOffice.org is competing with Microsoft Office for market share, and Mozilla Firefox has taken a sizeable chunk of the browser market share from Microsoft Internet Explorer. In some areas, open-source software has come to dominate the market, for example BIND, a domain name server and effectively the Internet's address book, has 95% market share.⁷ This makes

¹ Richard M. Stallman, "Free Software, Free Society: Selected Essays of Richard M. Stallman", 17, <http://www.gnu.org/philosophy/fsfs/rms-essays.pdf> (accessed March 14, 2008)

² In this context, hackers does not mean "security breaker" but rather "someone who loves to program and enjoys being clever about it", Stallman, *ibid*.

³ Stallman, 18.

⁴ *Ibid*.

⁵ Stallman, 19.

⁶ Stallman, 20.

⁷ Steven Weber, "Open Source Software in Developing Economies" (University of California, Berkeley, 2002), 6. <http://www.fossfa.net/fossfa/foss-ict-national-policy-south-africa/general-policy-statements/weber-open-source.pdf> (accessed January 30, 2008)

it a viable option for adoption in many locations including private and public organizations. Many countries, developing and developed, have even gone so far as to legislate FOSS as the preferred option when choosing what type of infrastructure to deploy.⁸ Of the developing countries to legislate as such are Argentina, Brazil, China, South Africa and Singapore, to name but a few.⁹ Each deployment strategy tends to be for a number of reasons and done in a variety of methods. For example, in Singapore, FOSS use is encouraged through tax breaks provided by the Singaporean government, while in China, the government has tasked the state-owned China Academy of Science with developing Red Flag Linux.¹⁰ FOSS has gained increasing acceptance in developing countries for its comparative advantage over proprietary software due to its inherent open nature. Steven Weber cites three broad reasons for FOSS adoption in developing countries: desire for independence, drive for security and autonomy, and new intellectual property rights enforcement.¹¹

As developing countries struggle to assert themselves, the quest for independence can become an important one. By cutting off their dependence from a single supplier (in the operating system or office suite case for example, from Microsoft) these countries reduce their reliance on an entity that might not be focused on the country's interests and simultaneously prevent these suppliers from taking the opportunity to exploit this monopolistic relationship.¹² There is also a financial aspect to this. Weber related how "a South African government council responsible for formulating the government's open source policy expressed foreign currency savings as an explicit rationale for considering OSFS [also known as FOSS] deployment."¹³ This is because FOSS allows for the investment of more domestic talent to develop the necessary software; an investment

that can easily be a boon to a nascent domestic software industry.¹⁴

Then there is the matter of security and autonomy. With growing fears of cyber-terrorism and cyber-crime, governments have begun to think carefully about public data security.¹⁵ FOSS at the very least introduces diversity in the software eco-system preventing a possible catastrophic failure due to a virus that would attack a monocultural software eco-system.¹⁶ In terms of security from infiltrators or malicious attacks, FOSS operating systems such as Linux reveal themselves to be as secure, if not more in certain cases, than closed-source ones.¹⁷ As for autonomy, Weber refers to a letter written by Congressman Edgar Villanueva to Microsoft Peru where he stated forcefully that "in order to guarantee the permanence of public data, the usability and maintenance of software should not depend on the goodwill of suppliers or monopoly conditions imposed by them" and that nations must be autonomous from systems controlled from outside the country so that they can guarantee national security.¹⁸ Weber puts it in historical terms by arguing that "[n]o national government, if it had alternatives, would have chosen during the 20th century to accept dependence for steel or petroleum on a single or small number of suppliers based in another nation."¹⁹ If we are to accept the importance of information technology to the twenty-first century world as that of steel and petroleum in the twentieth century, then reliance on single providers immediately reveals itself to be a foolish policy. What FOSS provides is the opportunity for a domestic software industry to take an active role in the developing of information technology instead of the country remaining locked

⁸ Weber, 26.

⁹ Weber, 28.

¹⁰ *Ibid.*

¹¹ Weber, 17.

¹² *Ibid.*

¹³ *Ibid.*

¹⁴ *Ibid.*

¹⁵ Weber, 18.

¹⁶ *Ibid.*

¹⁷ Carlos Serrao, Daniel Neves, and Paulo Trezentos, "Open Source Security Analysis: Evaluating Security of Open Source Vs. Closed Source Operating Systems", <http://paulotrezentos.polo-sul.org/artigos/ICEIS2003/opensourceAnalysis.pdf> (accessed March 14, 2008)

¹⁸ Weber, 18.

¹⁹ *Ibid.*

in to a single supplier that is usually from the United States.²⁰

At the very core of the Free/Open Source Software idea is intellectual property rights. In developing countries, massive software piracy remains one of the obstacles preventing the growth of a domestic software industry, as has been argued in the case of China.²¹ According to the Business Software Alliance, in 2006 piracy rates are among the highest in developing countries like Zimbabwe (91%), Vietnam (88%), Venezuela (86%), and China (82%) and lowest in developed countries such as the United States (21%), Japan (25%), Canada (34%), etc.²² What FOSS does is completely sidestep software piracy and renders it obsolete, which can be an attractive third way to tackling piracy.²³

Even more significant about FOSS in developing countries are its development capacities. FOSS can be a source for two major components of development: a technology transfer platform and a method for human resources capacity building. Many developers describe FOSS as a learning environment, so much so that in a survey carried out by the International Institute of Infonomics with developers, it is cited as being one of the main motivational reasons for contribution to free/open source projects.²⁴ In fact, it shows that 78% of developers participate in FOSS development to “learn and develop new skills” and 67% continue

“What FOSS provides is the opportunity for a domestic software industry to take an active role in the developing of information technology instead of the country remaining locked in to a single supplier.”

their participation to “share knowledge and skills.”²⁵ This not only leads to the development of domestic labour in developing countries, it also creates a form of technology transfer through informal apprenticeships.²⁶ Rishab A. Ghosh explains that FOSS communities are akin to informal apprenticeships where the apprentice/students and master/teachers contribute their time without any monetary compensation.²⁷ There are social costs but these are borne voluntarily by the participants and not directly by those who benefit from them like future employers or society at large.²⁸

The investments are not equal however, and certain “teachers” have been formally trained in universities or at work. These “teachers” end up paying more to train others.²⁹ What this amounts to is a form of technology transfer where those who can pay for formal training teach those who do not or cannot.³⁰ Within a country, the dynamic takes the shape of big companies teaching small and medium-sized enterprises, and globally this takes shape in developed countries teaching those in the developing countries who cannot afford formal training.³¹

Weber takes another approach to the same idea of technology transfer by highlighting the importance of these freely available technological infrastructures for the advancement of developing countries.³² He explains it as such:

²⁰ Weber, 20.

²¹ Mingzhi Li and Ming Gao, “Strategies for Developing China’s Software Industry”, *Information Technologies and Development*, 2003, vol. 1, issue 1, 64, pages 61-73.

²² Business Software Alliance, “Fourth Annual BSA and IDC Global Software Piracy Study”, <http://w3.bsa.org/globalstudy//upload/2007-Global-Piracy-Study-EN.pdf> (accessed March 14, 2008)

²³ Weber, 20.

²⁴ Rishab A. Ghosh, et al., “Free/Libre and Open Source Software: Survey and Study, Part 4: Survey of Developers”, (The Netherlands: International Institute of Infonomics, 2002), 45. http://flossproject.org/report/FLOSS_Final4.pdf (accessed March 16, 2008)

²⁵ *Ibid.*

²⁶ Rishab A. Ghosh, “The Opportunities of Free/Libre/Open Source Software for Developing Countries”, *The Fourth Bellagio dialogue on development and intellectual property: Moving the pro-development IP agenda forward: Preserving Public Goods in health, education and learning*, 8. http://www.iprsonline.org/unctadictsd/bellagio/docs/Gosh_Bellagio4.pdf (accessed March 16, 2008)

²⁷ *Ibid.*

²⁸ *Ibid.*

²⁹ *Ibid.*

³⁰ *Ibid.*

³¹ *Ibid.*

³² Weber, 20.

“To provide real products and services on top of the infrastructure requires an investment of local labor to start. Many emerging economies have a surplus of inexpensive technical manpower. Combining this with free software tools creates the possibility of an interesting kind of comparative advantage that will matter in local markets and in some cases might become important on global markets as well. (One of the advantages of the GPL is that it then prevents a dysfunctional enclosure of mobilized developing country resources into properties protected by patents that are offered for resale to the developing world at exploitative prices, a depressingly common pattern for knowledge intensive products as diverse as music, plant varieties, and pharmaceuticals.)”³³

Countries such as South Africa did not miss this, at least, not in an internal context. In a government report on FOSS it stated that FOSS facilitates technology transfer from academia to the private sector.³⁴ Reading further on the subject, it is clear that South Africa has fully endorsed FOSS as one part of its development plan. Following the report, South Africa has adopted a forward policy on open-source, which is:

1) The South African Government will implement FOSS unless proprietary software is demonstrated to be significantly superior. Whenever the advantages of FOSS and proprietary software are comparable FOSS will be implemented when choosing a software solution for a new project. Whenever FOSS is not implemented, then reasons must be provided in order to justify the implementation of proprietary software.

2) The South African Government will move current proprietary software to FOSS whenever

comparable software exists.

3) All new software developed for or by the South African Government will be based on open standards, adherent to FOSS principles, and licensed using a FOSS license where possible.

4) The South African Government will ensure all Government content and content developed using Government resources is made Open Content, unless analysis on specific content shows that proprietary licensing or confidentiality is substantially beneficial.

5) The South African Government will encourage the use of Open Content and Open Standards within South Africa.³⁵

A bit further in the document, it offers the justification that total cost of ownership is lower and return on investment is high. It also adds that many of the early barriers to FOSS adoption have rapidly eroded and that alternative business models have arisen which allow contributors to profit from their efforts without charging for the software itself and that there has been small and large commercial IT vendors that have professional teams contributing to open source.³⁶ Finally, it states that “because of the significant developmental benefits that result from the widespread use of FOSS/OC, in addition to the other positive benefits, the policy establishes a clear preference for FOSS/OC in the South African Government”³⁷

CONCLUSION

While there are problems with FOSS, it becomes apparent that there are many advantages that are very important or even unique to developing countries that FOSS can be of use for. As FOSS

³³ *Ibid.*

³⁴ National Advisory Council on Innovation Open Software Working Group, “Free/Libre & Open Source Software and Open Standards in South Africa – A Critical Issue for Addressing the Digital Divide”, Version 2.6.9, (July 2004), 26.
http://www.naci.org.za/pdfs/floss_v2_6_9.pdf (accessed January 30, 2008)

³⁵ South African Department of Public Service & Administration, “Policy on Free and Open Source Software Use for South African Government”, 3.

<http://unpan1.un.org/intradoc/groups/public/documents/CPSI/UNPAN025432.pdf> (accessed March 16, 2008)

³⁶ South African Department of Public Service & Administration, 4.

³⁷ *Ibid.*

continues to grow and evolve and in parallel as previously developing countries transformed into developed countries, it will be interesting to see if FOSS will carve a larger part of the software ecosystem or if the current dominant players will be able to adapt to retain control or even be displaced by new closed-source companies from the previously developing world. Will the focus on

FOSS in some countries lead to those who grew up with it to favour it, or will they instead take their skills learned from FOSS and apply them to creating the next Microsoft? Regardless of what happens, for many countries FOSS will have played some part in development, whether minor or major, free/open source software has become more than just an ideal.

Global Water Governance of Transboundary Rivers

Levels & Leakages: The Nile and the Implications for Global Water Policy

Rebecca Anne Dixon

A river can be the lifeline of a community, providing the most essential resource for human survival: water. This water is used for domestic consumption, agriculture and irrigation, industry, hydro-electricity and transport, and thus is crucial to a community's ability to meet the basic needs of its people as well as to the overall economic development of the region. When rivers cross the boundaries of states, conflicts can occur over a particular state's right to use and divert waters, potentially at the expense of other riparian states. The agreements for transboundary rivers at a global level are not widely supported or implemented nor do the corresponding institutions have sufficient legitimacy and authority to affect policy at regional, national and local levels. The fact that 263 watersheds crossing the political boundaries of at least two countries¹ are thus governed by complex and tense bilateral or multilateral arrangements. In order to move beyond the conflictual interests of the involved parties practicable coordination at the global level is needed.

This paper will examine the currently-existing global water governance structure of covenants and organizations. It will then review the circumstances and management of the Nile River, with a particular focus on resource use in Egypt, and Sudan, the riparian states with the firmest political and legal claim upon the river, as well as those taken on by Ethiopia, which has in the last two decades begun to assert itself and its rights to the Nile's waters. It will then examine the potential linkages and what stands in the way of these, ending with practical considerations for establishing effective global transboundary water governance. This paper will focus primarily on Nile development projects undertaken by Egypt and Sudan, the riparian states with the firmest political and legal claim upon the river, as well as those taken on by Ethiopia, which has in the last two decades begun to assert itself and its rights to the Nile's waters.

CURRENT GLOBAL WATER GOVERNANCE STRUCTURES

Modern transboundary river management has mostly evolved since the mid-nineteenth century in the form of bilateral or multilateral agreements between riparian states. While a reported 264 international water cooperation agreements have been set in place,² there remain 158 that lack "any kind of cooperative management framework in

1 United Nations Development Programme. "Transboundary Waters." Environment and Energy. Accessed November 12 2009. <<http://www.undp.org/water/priorityareas/trans.html>>

2 Water Governance Facility. "Transboundary Water Cooperation." Accessed November 11 2009. <<http://www.watergovernance.org/improvingwatergovernancereform/transboundarywatercooperation.html>>