Complexity science based strategies for development aid in rural areas of Afghanistan

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INTRODUCTION

In the period 1979-2001, Afghanistan became totally devastated by the Soviet invasion (1979-1989), the Civil War (1989-1992), the Taliban Regime (1996-2001) and other conflicts. In December 2001, the Taliban government was overthrown and a new Afghan government was formed. After that, Afghanistan has been the receptor of huge amounts of international aid (humanitarian and development) and security investments. The country received US$50.7 billion in official development assistance between 2002 and 2012, including US$6.7 billion in humanitarian assistance [1]. In this period, aid brought important improvements in some basic development indicators (see Figure 1).
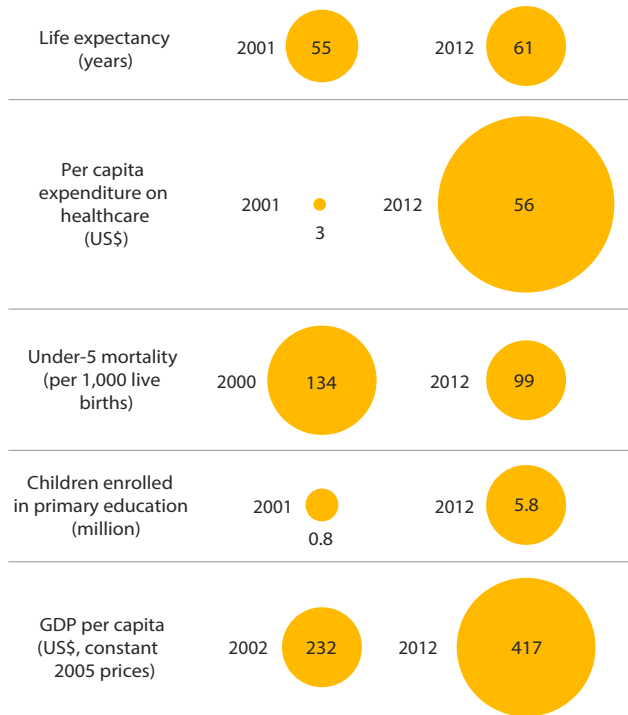
Figure 1: improvements in development indicators for the period 2001-2012 [1]

However, poverty, lack of education, insecurity, dependency on international aid, inequality and other important problems remain. This is reflected in the fact that Afghanistan ranks in the position 171 of 188 countries in the Human Development Index 2015 (last world position among non-African countries) [2]. We think that one of the reasons why sustainable development has not been achieved in Afghanistan is because the problem is not being tackled with a complexity science perspective.

In this research, we use complexity science concepts to propose strategies for achieving sustainable development in rural communities of Afghanistan. The strategies might inspire aid programs for achieving the 17 United Nations Sustainable Development Goals for the period 2016-2030 (Figure 2), and also the aim of the Afghanistan's Transformation Decade to become a self-sufficient country [3].

Figure 2: the 17 Sustainable Development Goals 2030

THE *COMPOSED HYPOTHESIS*

In the following, we present a *composed hypothesis* (made out of six linked hypotheses) of what could be a successful strategic approach for achieving sustainable development in rural communities of Afghanistan. In the next paragraph, the six linked hypotheses will be described, which are based on complexity science principles. Then, in the rest of the article, we will proceed to show that these hypotheses are likely to be true based on scientific models and arguments. The *composed hypothesis* goes as follows.

Hypothesis 1: "in a fragile country like Afghanistan, the powers held by communities and insurgencies are better to be distributed rather than concentrated, because will less likely allow for big instabilities". There are other holders of power, like international aid organizations, but in this case, **hypothesis 2:** "power held by international aid organizations will create more social impact if it is more concentrated, cooperative and interconnected". International organizations aid can be applied at different scales. We think that, **hypothesis 3:** "in Afghanistan, aid will be better spent mainly at an intermediate scale (socio-economical structure), rather than at a high scale (nation) or small scale (people)". If aid is better spent mainly at an intermediate scale, which type of projects may benefit the rural communities the most? **Hypothesis 4:** "Instabilities in Afghanistan means that communities cannot depend too much on others for its survival, so a main focus of aid can be resiliency". But how to create projects

that will improve community resiliency in the long term? **Hypothesis 5:** "resiliency challenges in each community can be tackled by creating innovation project ecosystems". We think that, **hypothesis 6:** "these ecosystems may generate tipping points in rural communities and even at a country level".

Figure 4: Negative slopes (α) of all the analysed conflicts [4]

> **Hypothesis 1:**
>
> *"in a fragile country like Afghanistan, the powers held by **insurgencies** and **communities** are better to be distributed rather than concentrated, because will be less likely to allow for big instabilities."*

Insurgencies. Sean *Gourley et al* [4] plotted the number of insurgent attacks vs. the number of casualties in given periods for different countries in the world. Their plots were characterized by patterns called power laws. For the countries of Afghanistan, Iraq, Colombia and Peru the power laws patterns looked as follows:
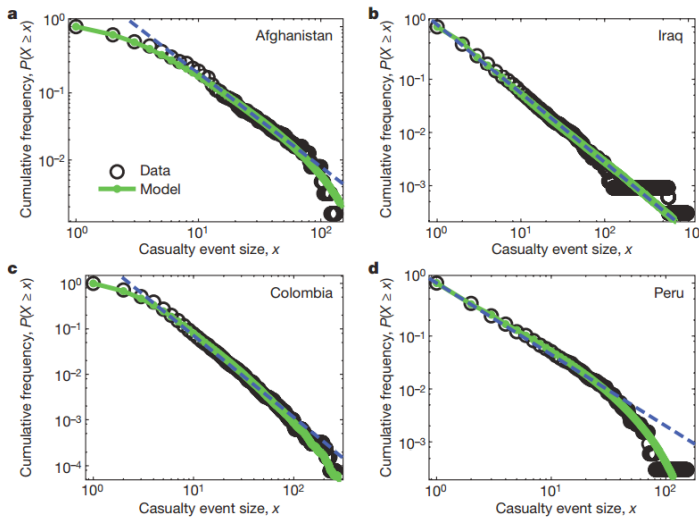

Figure 3: Insurgent attacks vs. Number of casualties for a given period in Afghanistan, Iraq, Colombia and Peru [4]

He found power laws as a fundamental signature in every conflict in the world, regardless of religion, geography, weapons and circumstances. The negative slopes of all the analyzed conflicts, called α, were clustered around 2.5 (see Figure 4).
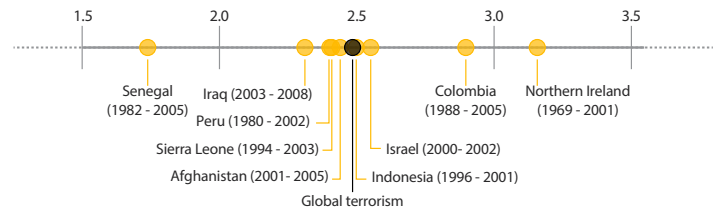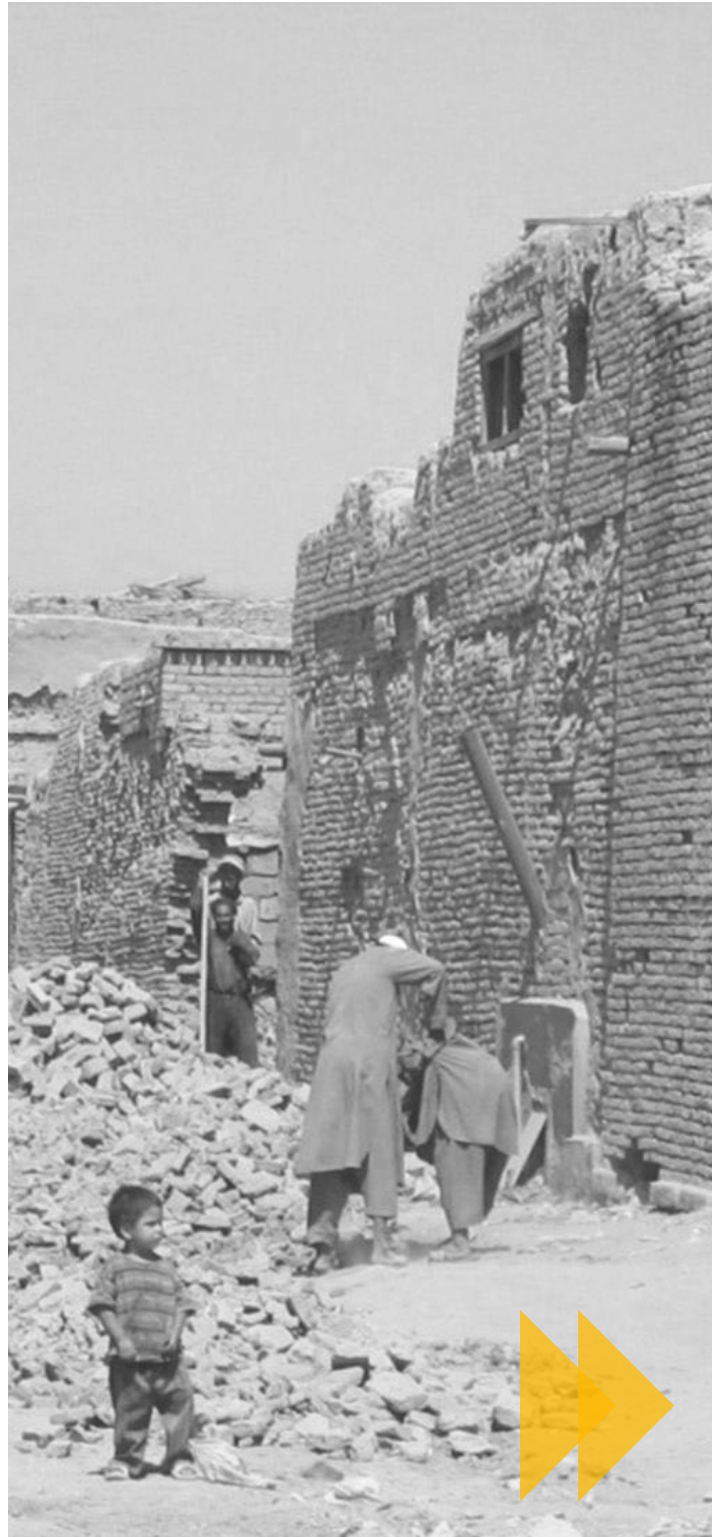
One of the ways he proposes for finishing insurgency in a given country is by increasing the magnitude of the slope (see Figure 5), which means a fragmentation of power that leads to more and smaller groups, up to a point that they are not powerful enough so that they disappear.

In the case of Afghanistan, the geography of the current insurgency military situation, as of April 29th 2016, is depicted in Figure 6.
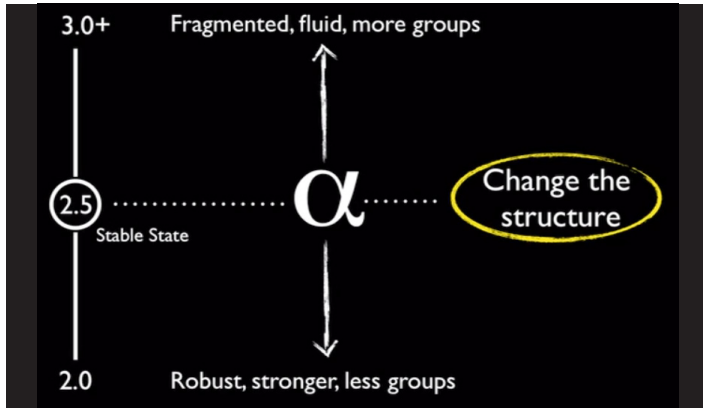

Figure 5: effect of changing the slope (α) [4]
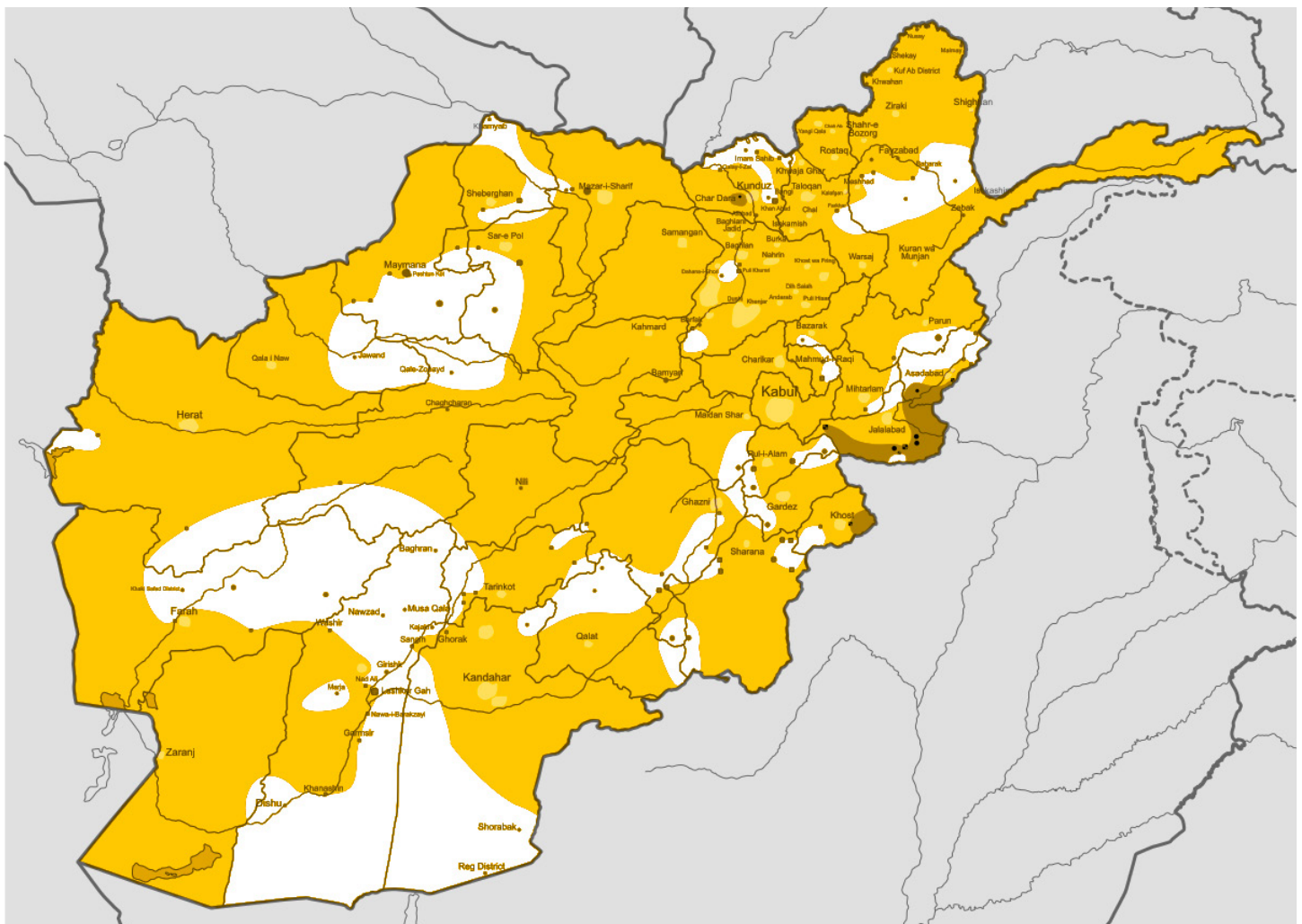

Figure 6: Current military situation, as of 29 April 2016. ●Under control of the Afghan Government, NATO, and Allies. ○Under control of the Taliban, al-Qaeda and Allies. ●Under control of the Islamic State of Iraq and the Levant [5]

It can be seen that the Taliban controls big areas of the country. One possible military strategy might be to work at community levels to fragment this zones as much as possible. This can dilute power, which may help in the future disappearance of insurgent groups.

Communities. Power at a community level may be analysed using Afghanistan's basic social units, called *qawms.* These are similar to a tribe or a community, and are based on kinship, residence, or occupation. Moreover, *qawms* are network-based power structures. *Geller and Moss* [6] made an agent based model (ABM) of *qawms*. Figure 7 depicts the actors and interactions inside a *qawm* used in the ABM.
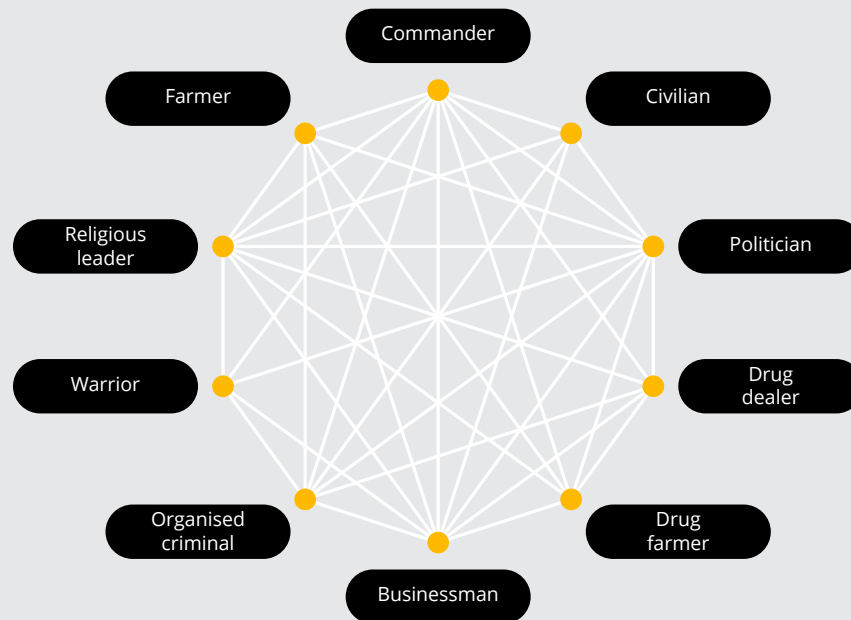
Interactions: If a politician is in need of military protection, he approaches a commander. In return, a commander receives political appreciation by mere cooperation with a politician. If a businessman wants to be awarded an official construction contract by the government, he relies on a politician's political connections. In return, the politician receives a monetary provision, for example, bribes. If a politician wants beneficial publicity, he asks a religious leader for support. The religious leader, in return, becomes perceived as a religious authority. If a warrior seeks protection and subsistence for his family, he lends his services to a commander, who, in return, provides him with weapons, clothes, food and/or money. If an organized criminal wants to carry drugs, he relies on the transport business of a businessman who, in return, receives a share of the drugs sold. If a drug farmer needs protection for his poppy fields, he affiliates with a commander, who, in return, receives a tithe of the drugs sold to a local drug dealer. Such interactions are also guided by the following four social categories: kinship, residence, class, and religion.

Figure 7: *actors and interactions in a qawm [6]*

They made simulations with 200 agents: 6 politicians, 6 religious leaders, 6 businessmen, 6 organized criminals, 6 commanders, 10 drug dealers, 35 drug farmers, 35 farmers, 70 civilians and 20 warriors; the result was a network composed two *qawms* (clusters). They showed how *qawms* evolve as heterogeneous concentrations of power generated by mutually dependent and interacting agents/actors that compete or cooperate. The authors conclude that the totality of *qawms* in Afghanistan do not form a unified system of power but a cosmos of mutually interacting power systems. They argue that this cosmos might be a root source for political volatility and unpredictability and ultimately an important explanatory factor for conflict in Afghanistan. Then, we suggest that aid strategies take into account the *qawms* structures, and use game theory based strategies to balance power.

> **Hypothesis 2:**
>
> *"power held by international aid organizations will create more social impact if it is more concentrated, cooperative and interconnected."*

There are other holders of power rather than insurgencies and *qawms*, and these are international aid organizations. In the book Aid On the Edge of Chaos [7], the author Ben Ramalingam describes how a research scientist called Eva Schiffer addressed a water management problem in Ghana using networks. She made a workshop with many important stakeholders to create a picture of the relationships between the key actors who influence water usage patterns. Through energetic discussions about who was related to who and why, they created a network and identified the most influential actors and their goal orientations. Key network metrics such as centrality, density and shortest paths were inferred. The network built allowed stakeholders to see through a very different lens their individual roles and what were the dynamics of the whole system.

Ramalingam also talks about some Canadian and American researchers that used social network analysis in a flood response in Mozambique to study the relationship between NGO network position vs. effectiveness. They found that the most effective NGOs were the most central to the network. Although this might be intuitive, this is not the case for some major organizations that even assess their efforts using metrics such as 'speed of response relative to others'. Ramalingam also examined these issues through a game theoretical approach in which they argued that the structural dynamics of the humanitarian system are such that, at the point of crisis, it always seems to pay to defect (work alone) from what would be an optimal cooperative solution.

The workshops made by Schiffer and network analysis made by the Canadian and American researchers might be applied in Afghanistan to optimise aid; and they can be complemented with a game theory approach to promote collaboration among NGOs.

> **Hypothesis 3:**
>
> *"in Afghanistan, aid will be better spent mainly at an intermediate scale (socio-economical structure), rather than at a high scale (nation) or small scale (people)."*

In the book Making Things Work [8], the author Yaneer Bar-Yam, President of the New England Complex Systems Institute, says that: "Traditional efforts to provide assistance tend to focus on either the smallest level of organization, the individual, or the largest, the nation as a whole. Directly helping individuals or directly helping nations results in a weakening of the intermediate levels of structure that are essential to the functioning of a complex society. These intermediate levels are the interactions between people, and groups of people, that comprise trade and commerce, cooperation and competition, which are the basis of economic and social activity." He gives the large scale example of

the World Bank, that has given loans to developing countries for big infrastructure projects, which had no good impact in the future. For instance, large dams built under those loans have frequently failed to provide their claimed benefits, and have had a cruel cost on local economies due to displaced populations and environmental problems. In the other extreme, he mentions the small scale example of giving aid directly to people, and how it might be disastrous. For instance, distributing food straight to individuals disrupts local mechanisms of food production, gathering and distribution; so when the aid organization goes away, leaves the region even more vulnerable to food shortages and even more desperate for continued aid.

In an interview we did to Noorrahman Rahmani, director of the Institute of War & Peace Reporting in Afghanistan, he told us about huge amounts of aid given to the government of Afghanistan for infrastructure projects that don't result in true development, and how this aid might increase corruption. This leads us in our research to think that aid in rural areas of Afghanistan can be mainly (not necessarily totally) focused on the intermediate scale.

Hypothesis 4:

"Instabilities in Afghanistan means that communities cannot depend too much on others for its survival, so a main focus of aid can be resiliency."

If aid is better spent mainly at an intermediate scale for creating social and economic structure, in which type of projects should it be spent? We consider that the most important focus must be to increase community resiliency. By resiliency we mean auto-sufficiency in livelihoods, as well as capacity to avoid or absorb shocks like insurgent and natural disasters events. The reason is that communities in Afghanistan need to be very resilient in order to survive hard economic situations, as well as insurgencies and typical country natural disasters like earthquakes, flooding, drought, landslides, and avalanches.

One way of measuring community resiliency in this country is by using Geographical Information Systems (GIS). Aid organizations like World Bank and UNDP are now more and more using GIS. Services like telecom, electricity and water are distribution networks that can be mapped via GIS. Distribution of goods like food, medicine, and clothing may also be mapped. Natural disasters and climate change can be prevented via GIS and remote sensing analysis. Examples of GIS maps are shown in Figure 8.
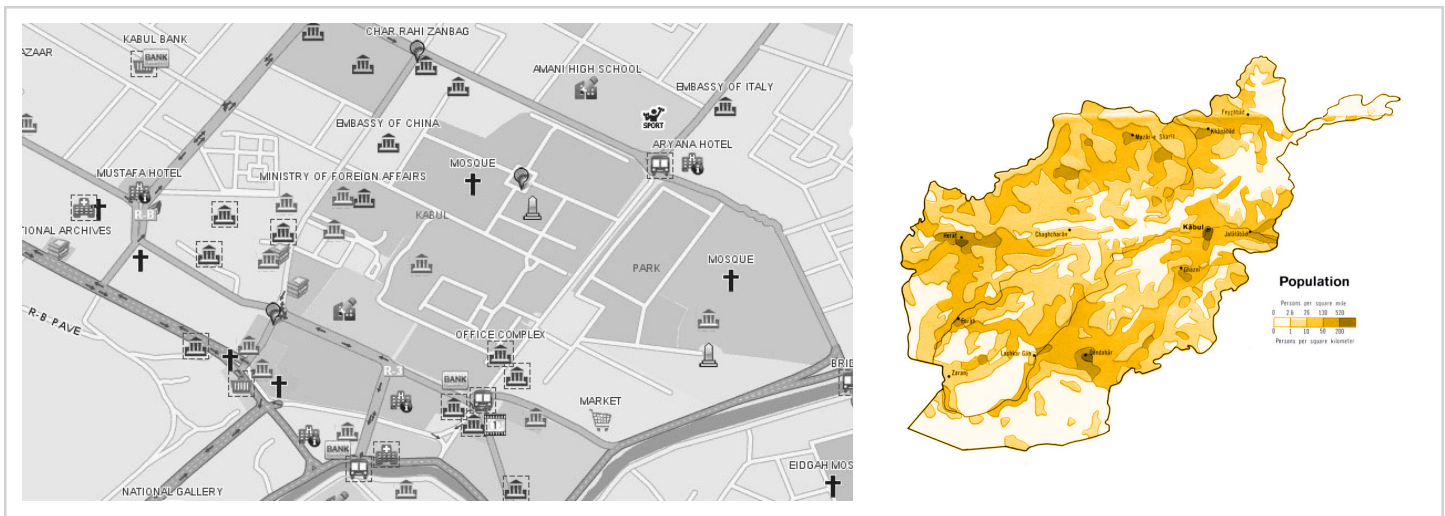
Figure 8: *Left: Map of services in Kabul [9]. Right: Population map of Afghanistan [10]*

An example of GIS for resiliency given by Widener *et al* [11] is the following. Afghanistan is responsible for the majority of the world's supply of poppy crops, which are often used to produce illegal narcotics like heroin. They made an agent based model that simulates policy scenarios to characterize how the production of poppy can be dampened and replaced with licit crops over time (like basic livelihood crops that increase community resiliency). Further research about use of GIS in rural Afghanistan can be about finding spatio-temporal signatures of sustainable development and using calibrated agent based models to design public policies.

Hypothesis 5:

"resiliency challenges in each community can be tackled by creating innovation project ecosystems."

Creating projects in such a way that local people are the ones that solve the resiliency challenges is optimum, since it constructs the organization and structure necessary for development. Then, a successful strategy might be to mimic the innovation project start-up ecosystems from which projects that changed the world like Dropbox, Uber, and AirBnB were born, but in a way adapted to rural Afghanistan.

This approach to development from the local structure upwards is supported by an example from biology: the evolutionary development of organisms, which produce multiple offspring. In a given generation the successful ones multiply, and the unsuccessful ones perish, eventually resulting in a generation more suited to the environment. Contrast to this is the development of a fetus, in which the womb is shielded from the external environment so that the growing from a single cell can progress to the point where the entire organism is functional to survive outside the womb. However, we do not understand social development sufficiently to device shielded strategies, so multiple smaller scale projects are the best way to identify what will work or not [8].

Aid organizations can manage these ecosystems. They can make project competitions for solving water, security, energy, crop issues, etc. The best projects will get funding and mentoring, and then project owners can mobilize volunteers and community groups to achieve goals. Empowering local people will reduce aid given directly to the government, which can increase corruption and subsequently insecurity [12]. Also it will diminish dependency on insurgent groups as providers of goods [13]. Startup ecosystem initiatives like StartupGrind (by Google) just arrived to Kabul in recent months. So we urge aid organizations to adapt this approach to rural areas.

Society and other natural systems may display tipping points. These are points in time where a small change in a system variable modifies the system qualitatively, creating a dramatic effect in its state at some time in the future – not necessarily immediately. The concept became famous among social scientists since Grodzins and also Schelling [14] studied why suddenly in American neighbourhood's white people move out *'en masse'* after a certain percentage of residents were black. We think that small aid projects can cause tipping points in Afghan communities, in a similar way as Malala's (Nobel Peace Prize winner) head-shot by the Taliban generated a tipping point of education (system variable) in Pakistan.

Rather than just exponential growth of a system variable, tipping points are associated with physics concepts like *unstable equilibriums, bifurcations and phase transitions* (all of which somehow may cause exponential growth). They can be *contextual*: when one variable causes other to tip; or *direct*: when a variable itself, after surpassing a threshold, depicts some sort of exponential growth [15]. Both types of tipping points in society make the system to shift from one equilibrium state to another (i.e. from very low percentage of people going to school to a very high percentage).

Sustainable development depends on many variables, as observed in the 17 UN goals. Aid organizations might become aware of tipping points by finding how small changes in one variable may affect others in a great way; or which threshold a variable must surpass in order to go from one equilibrium to another.

CONCLUSIONS

In a fascinating research, we unveiled different complexity science principles that may be used for aid strategies based on a composed hypothesis. Power laws showed us that if insurgent power is segregated then it might help insurgent groups to disappear. We learned by an ABM that *qawms* naturally evolve in Afghanistan, and that these social units must be taken into account by aid organizations since they might be a root of conflict at a community and country scale. Now we know that workshops of aid organizations can be made in order to visualize and understand the aid organizational network; and that being well connected leads to more effectiveness. We discovered Bar-Yam's argument about the importance of the intermediate levels of structure in a society. Then we realized that a good aid focus is community resiliency, which can be measured and analysed via GIS. And that an effective way to achieve it is to empower people by building a start-up like ecosystem of projects. Finally, we acknowledged that since we live in a non-linear world, aid organizations must try to find which small projects that can cause tipping points.

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