The proposed conceptual framework template for the SIAGI project

The SIAGI project deals with a diverse range of issues that cut across a large number of disciplines. Unsurprisingly, within our interdisciplinary team, we have divergent views, preferred methodologies and terminologies to describe the same concept. During the Australian team meeting in Brisbane in August 2016, while discussing the risk assessment component of the project, it emerged that we all held different ideas about how "risk" is defined and how it is assessed. We discussed various existing frameworks – for example, the classical risk formula (risk = likelihood x impact) and the 'vulnerability framework' commonly used in climate change risk assessment, among others. However none of the existing frameworks were deemed appropriate for the scope of issues and impacts addressed in the SIAGI project and how we intended to analyse them. Furthermore, the existing frameworks posed a significant challenge with the use of terminology (e.g. risk, resilience) that held different meanings to different members of the team. To overcome these challenges, we propose adopting our own framework, which we devised to enable all perspectives and processes (including issues/problems, risks/opportunities) to be mapped out using a common 'language'.

In our conceptual framework template, processes are described in terms of a *change to capital*, the *direct* and *indirect drivers* of this change, and the *direct* and *indirect impacts* of the change (Fig. 1). We selected terms that are unambiguous, yet broadly applicable and neutral, avoiding value-judgments (for example terms such as threat, risk and vulnerability have negative connotations). The use of more neutral terms will enable the framework to be used to represent opportunities and more positive directions of change for our project case studies.

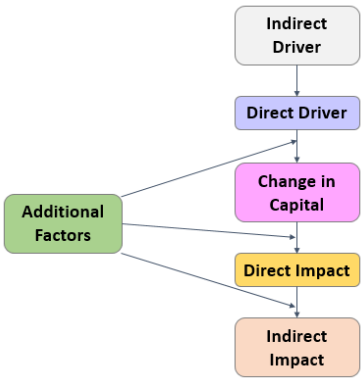

Figure 1. The proposed conceptual framework template for assessing system processes and changes

A *change in capital* can include any increase or decrease in any social, financial, human, physical or natural capital (including assets, skills, resources, values etc). This change in capital can be caused by more than one direct driver. The change may also lead to multiple impacts. *Additional factors* can be any factor that affects the rate of change – i.e. one that increases or reduces the magnitude of change or impact, or the capacity of the subject to avoid, cope with or adapt to the specified change.

Figure 2 shows an example of the use of the template to describe a process. In the example, the change in capital is groundwater depletion, which is caused by decreasing rainfall and overextraction of groundwater. The overextraction of groundwater is driven by the lack of enforcement of groundwater policies and the lack of awareness about water conservation in the community. The impacts of the groundwater depletion include reduced water available for irrigation and poor

agricultural productivity. Poor agricultural productivity in combination with the low market price for produce can lead to financial stress on the household, which in turn can lead to flow-on effects (*indirect impacts*) such as seasonal migration, the inability to meet education costs and food insecurity.

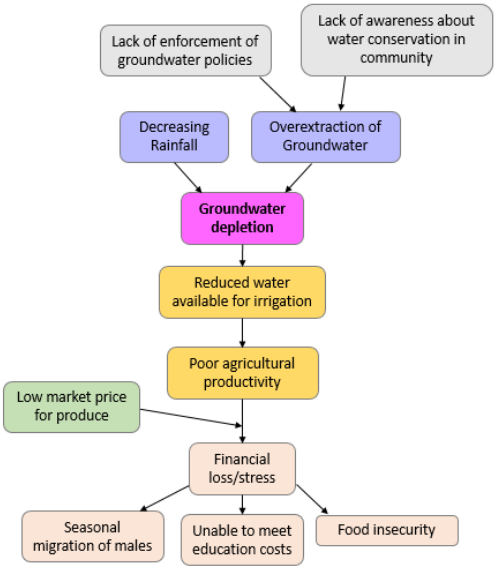

Figure 2: Example of the use of the template to describe the problem of groundwater depletion

The template is modular in nature, so the diagrams can be readily combined with others to capture multiple system processes and more complex pathways of influence. As multiple diagrams are combined, impacts from a change in one capital may become drivers for change in other capitals. The idea is to allow divergent ideas from the team to be mapped out and linked together in one common framework, facilitating a genuinely interdisciplinary process.