

EVALUATING SYNERGISTIC BENEFITS OF A HOLISTIC COMMUNITY DEVELOPMENT PROJECT APPROACH

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Abstract

Community Development projects in developing countries often adopt a single-goal short-duration approach which does not address communities' multiple, self-identified needs. Zahnd (2013) explains why it is crucial to take a holistic long-term approach that addresses all the different needs the beneficiary community identifies to realize effective and durable community development solutions. This paper analyzes potential synergistic benefits that arise when targeted investments, through different, simultaneously implemented projects, addressing a wider range of end-user identified needs, are implemented in close partnership with the end user community. A mathematical model was developed which can be adapted to specific communities to predict the potential synergistic benefits of a long-term, holistic community development (HCD) approach. This model, embedded into Octave, introduces 4 variables from an interactive menu, to assess synergistic benefits that will emerge in a community for the indicators of health, hygiene, wellbeing, productivity and GDP impact once RIDS-Nepal's HCD concept „Family of 4“ was implemented. The input variables define the users' qualitative use of each of the „Family of 4“ projects: pit latrines, smokeless stoves, basic indoor electric lighting and access to clean and sufficient water. The study is based on the work done by RIDS-Nepal in the district of Jumla, northwestern Nepal, during spring 2019.

Keywords: holistic community development (HCD), synergistic effects, “Family of 4”, “Family of 4 PLUS”, health, hygiene, wellbeing, RIDS-Nepal, developing countries, Octave assessment tool, SDGs

1. Introduction

The practical work leading to this paper is being realized in Nepal, ranked as one of the poorest (149th out of 189 countries in 2017 in terms of Human Development Index (UNDP, 2018)) and least developed countries in the world. Nepal has a child mortality rate of 27.9 deaths / 1,000 births, an average national life expectancy of 71 years (both data from 2017) and 25,2 % of its population living below the poverty line in 2011, listing it 66th position in CIA's ranking of countries based on poverty (CIA, 2019). Nepal's per capita GDP is ranked as 165th in the world, with a value of 1,025 US \$ in the year 2018 (World Bank, 2018). However, interregional differences, especially in the remote, high-altitude areas where this study took place, vary significantly within the country, with factors 5 – 10 lower, making the average national GDP not an accurate estimate for all regions in Nepal.

Agriculture represents 27 % of national GDP and industry 13.5 % (CIA, 2019). Nepal is one of the countries in the world where remittances, money sent from abroad by Nepali migrants, are the highest; the World Bank estimates that 27.98 % of Nepal's GDP was money sent from abroad (World Bank, 2018).

Large socio-economic differences exist within Nepal, where geography poses great obstacles for transport and communication to isolated Himalayan areas, making these mountainous zones very disadvantaged from a developmental perspective in comparison with more urbanized areas, the capital or the southern lowlands. The country is divided in 3 geographical zones, being these from north to south the high-altitude Himalayan mountains (2,000-8,848 m.a.s.l.), mid hills (800-2,000 m.a.s.l.) and the Tarai (80-800 m.a.s.l. in the southern flat plain). Climate is very different in these 3 areas due to their large contrast in altitude (from 80 m.a.s.l. in the Tarai to over 8,000 m.a.s.l. in a north-south distance of only 200 km).

Further, significantly more development took place in recent decades in the mid hills and the Tarai, making them much better off and wealthier compared to the high-altitude mountain area.

This work is based on the author's experience during her internship in Nepal, where she worked in the north-western, rural mountain area, conducting a study about the sustainability of a holistic community development approach, analyzing synergistic benefits arising from this multi-sectorial development approach. The concepts of HCD and its synergistic benefits will be thoroughly explained in this paper. The organization hosting the internship leading to this work is called RIDS-Nepal, short form for Rural Integrated Development Services Nepal. RIDS is a Nepali not-for-profit NGO which has been working since 1996 in the remote districts of Jumla and Humla, 7th and 2nd poorest districts (in terms of HDI) of 75 in Nepal (Sapkota, 2014). In Jumla 49 % of the population are under the poverty line and in Humla even 56 % (NepalMap, 2011). They are both located in the north-west of the country, in the midst of the Himalaya range, far from the capital, and with extremely poor transportation infrastructures. For example, the district of Humla still has no road access so the only way to get there is by airplane and get around by foot or animal. The road to Jumla, although now existent, is not much better either: it is one of the world's most dangerous routes, where landslides onto the unprotected, often unpaved road are a frequent phenomenon.

RIDS-Nepal has 4 offices with well-trained, district-local staff; and foreign volunteers who come 1-2 times a year for a duration of 1 to 2 months each time. The author's internship has been 2 months long, based in Mohari village (Lat: 29°20'06" / Long: 82°22'26" / Alt: 3,150 m.a.s.l.) in the north-east of the Jumla district, a village with 40 households and approximately 230 inhabitants. It is located 26 km from the district center, Jumla Bazaar, and is only reachable by foot, tractor or motorbike. Mohari village is located at the end of a valley, surrounded by mountains over 5,000 m high. People in the area are used to walk long distances to reach other villages. RIDS-Nepal has a well-established office in Mohari, but, dependent on the ongoing HCD projects, the staff also work and stay in neighboring villages such as Pere, Dopa and Chaura.

The NGO has developed an interesting concept which is an effective way to address in a more sustainable way development needs identified by the poor, remote territories: The Holistic Community Development (HCD) approach. This concept supports the idea that real and long-lasting development needs a holistic view of the issues and context of a community, a broad understanding and contact with the local culture and beliefs and a long-term presence in the region to build trust and properly train the beneficiaries with the goal to make them autonomous. The long-term HCD approach goes way beyond addressing a short-term a single-oriented development need such as e.g. the building of toilets only or building a drinking water system only. The HCD approach aims to tackle the multiple needs the beneficiary community identified to be addressed in partnership with an NGO such as RIDS-Nepal.

Based on RIDS-Nepal's holistic community development concept called "Family of 4" the author has developed a software assessment tool written with the open source programming language Octave. This program evaluates the descriptive inputs of how the 4 projects included in RIDS' "Family of 4" HCD concept are being used in a community. This tool aims to evaluate potential synergistic outcomes for the beneficiary community in a qualitative narrative of an implemented "Family of 4" HCD project in regard to the indicators health, hygiene and wellbeing. From these 3 results the tool extrapolates how they affect the productivity and potential GDP impact of the community.

The topic of Development Aid is of global importance since it affects billions of people in the world. Vast amounts of money are directed every year for this purpose from countries in the Global North to the Global South. Official Development Assistance (ODA) from the 30-member countries of the Development Assistance Committee (DAC) worldwide mobilized 153 billion USD in 2018 (OECD, 2019a), which were sent to a total of 146 countries (OECD, 2019b). Nepal e.g., received a total of 1,309.3 million USD in 2017 from ODA, OOF (Other Official Flows) and private donors (OECD, 2019b).

Funds being transferred to developing countries sum up to high amounts, making Development Aid an exceptionally relevant and influential intervention in most of the countries in the world. This fact is where the relevance of the topic chosen for this paper comes from, since Development Aid is a major player for

billions of citizens on our planet, influencing their lives. There is an open, ongoing discussion about the effect of Development Aid between the developed and developing countries, since a big percentage of the transferred money does not reach the intended target. Many geopolitical interests are also involved in Development Aid and money transferred for "good purposes" can in reality cover some hidden political intentions. There are many criticisms to Development Aid, such as the concept of neocolonialism, corruption, creating economic dependence to aid recipient countries, patronizing attitudes towards developing countries, etc. That's why internationally agreed and clear guidelines for development organizations have to be in place and adhered to, because we can make a difference in the world if we face the undeniable challenge to radically change the lives of people in need through well-led Cooperation and well-designed community development projects.

This paper is an attempt to analyze the new community development approach RIDS-Nepal designed aiming for development projects which are more sustainable and create a real impact for people, improving the lives of the benefiting communities in a dignified way. Money is one of the key issues in the field of development and in designing context-relevant and good projects with effective and lasting improvements of peoples' living conditions. Aiming for sustainability and trying to achieve the Sustainable Development Goals set for 2030 are important aims to consider in the design of each community development project. How can we design effective strategies and development projects with the target community? How long will the projects last for? Will development interventions improve some aspect of people's lives in a durable way? This paper will look into these and other aspects and will suggest a holistic community development procedure for sustained improvements in the lives of people in the remote north-west of Nepal, which has a high potential to be applicable in other parts of the world with similar development needs, through appropriate contextualization.

2. Research questions and objectives

There are two points of focus in this paper:

One focus point is to assess the synergistic benefits arising from a long-term, holistic community development approach and the other one is to analyse discernible and/or measurable **sustainability** of this kind of projects. In order to set a clear goal for this research project, the following main research question and subsequent sub-questions are posed:

- Are there sustained, identifiable and/or measurable synergistic effects created by introducing long-term, local-scale and multi-sectorial development projects in a community rather than large-scale but single-oriented interventions?
 - If yes, what are those synergistic effects and how can they be qualified and quantified?
 - Can they provide an alternative for long-lasting development?
 - To what extent are these effects enabling long-term sustainability of the expected benefits?
 - In what ways will peoples' lives in Mohari village change in the long run through the long-term, multi-sectorial holistic community development approach introduced by RIDS-Nepal compared to the short-term, single-oriented community development approach?

The research question evolved from the hypothesis that Development Aid is not as effective as it could be if more emphasis on how to better design sustainable development strategies would be given. This happens because in many cases development programmes only foresee 1- or 2-years long project life-cycles with only a single, one-faceted project (as e.g. electrification, OR sanitation, OR vaccinations...), that cannot unleash the potential of a more holistic, long-term, multi-sectorial project approach. Following this rationale, the hypothesis goes on to state that development projects could be made much more effective and sustainable if multi-sectorial development solutions are considered based on the end user community's own identified needs. Multi-sectorial (or HCD) projects are more time demanding, harder to implement and often more expensive because several interventions need to be developed and designed with mutual complementary and supportive long-term benefits in mind. However, they will potentially have a wider and more sustainable impact in peoples' lives, compared to a single-oriented, short-term intervention. Further, the hypothesis also claims that it is more valuable in the long-term to

significantly improve the lives of a few people than to aim for an impact in just one single aspect in peoples' lives but for potentially more people. HCD projects, if well designed for a defined context, enable the beneficiaries in the long run to learn how to stand on their own feet once they are equipped with multifaceted solutions, addressing all the basic needs they themselves have initially identified. This approach is persuasive, creating a long-term multiplying effect based on end users' awareness, empowerment and required skills to attain increasingly by themselves their development needs and goals.

3. Methodology

The methodology chosen for the theoretical part of this work is an embedded single-case study, with multiple units of analysis. The general unit of analysis is Mohari village, where RIDS-Nepal has partnered with the Mohari village community since 2002 in long-term HCD program activities. The families and individuals in the village (40 households, around 230 inhabitants) form one set of subunits to be studied. The HCD projects implemented by RIDS-Nepal ("Family of 4" and "Family of 4 PLUS") form an additional set of subunits to be studied, specifically: pit latrines, smokeless metal stoves, electric lights (available through 20-Watt solar PV home systems) and access to clean drinking water. The first set of subunits, the people living in Mohari, are the beneficiaries from the other set of subunits, the HCD projects. Therefore, there will be 2 different types of subunits to analyze.

From the practical side, the methodology followed has been hands-on field work. RIDS-Nepal's holistic approach to community development requires direct contact with the end-user community, a long-term relationship with them and a provision of multifaceted engineering, infrastructure and educational solutions, which are implemented together with the beneficiaries. RIDS-Nepal's methodology for a sustainable way of implementing the "Family of 4" projects is to train and empower the people to build and install the projects in partnership with RIDS-Nepal. Know-how and the materials that cannot be obtained locally are provided by RIDS-Nepal. RIDS-Nepal's spirit and principle are to show the people how they can improve their lives by building the projects themselves, which gives the communities a real ownership and healthy feeling of pride for the implemented projects. This enhances the projects' potential for sustainability. Creating an interest among the beneficiaries to maintain each "Family of 4" project is key to enable long term self-sustainability.

4. Holistic Community Development and synergistic benefits

RIDS-Nepal's Holistic Community Development concept "Family of 4" envisages a development strategy specifically designed for people living in the remote, high-altitude Himalayan districts of Humla and Jumla, in north-western Nepal, but which could also be applied in other developing regions in the world. The HCD approach takes into account several aspects people in those areas identified as their needs in order to improve their overall living conditions and everyday lives. It aims to address the needs faced and identified by the people living in these remote areas in a holistic way. That means the problems and daily basic needs are addressed with long-term solutions in a multifaceted way. The "Family of 4" HCD program consists of the following four basic, strongly correlated and sequentially implemented projects:

- A pit latrine for each family
- A smokeless metal stove for each family
- Basic electric indoor lighting in each family's home
- Access to clean and sufficient drinking water from various tap stands in the village

Each project is implemented in close partnership between the local user family and RIDS-Nepal, which also provides the initial trainings and skills needed to actively participate in the building and realizing of each project. So, e.g. each family has to provide the local materials needed for each project, such as e.g. wood and stones to build the latrines. Also, they have to dig the septic tanks for the pit latrines, pay a small part toward their smokeless metal stove and porter the stove home from the RIDS-Nepal office.

Each family also participates in the installation and operation and maintenance training of their smokeless metal stove. Likewise, each user family participates actively in the electric lighting project, be it through a solar PV home system or a small hydro-power plant. Equally, the users are strongly engaged in each step in the design and building of their village drinking water system and village tap stands (e.g. constructing a water intake tank, underground piping system for the water to flow to the village and building the cemented village tap stands). RIDS-Nepal provides all materials which are only externally available and need to be portered to the village.

The reason behind this holistic concept is that people have more than “just” one need such as electricity or drinking water. Their lives are more complex and thus their needs multi-sectorial. In this way, a long-term path toward sustainable community development is laid, with the end users as main actors and owners of each project and program, with RIDS-Nepal as the partnering NGO as helper and adviser for a defined time period of several years (ideally up to 2 generations). The direct and personal involvement of the beneficiaries in the implementation of each of the "Family of 4" projects is a central requirement and another differing characteristic of this concept compared to most governmental and other NGOs/INGOs development strategies in Nepal. RIDS-Nepal's vision is to avoid a classical patronizing, one-sided implementation of projects as has been seen often over the decades of Nepal's development since the 50s and many other developing countries' in the world.

Beyond the "Family of 4" approach, RIDS-Nepal has also developed the "Family of 4 PLUS" HCD concept, which includes additional projects based on the implemented "Family of 4" projects. Contrary to the "Family of 4" under which all four projects **have** to be implemented, the "Family of 4 PLUS" HCD is a more “open” HCD concept with projects and programs which RIDS-Nepal developed based on different village communities' previously identified needs. However, they can be considered individually or in various combinations to be implemented, according to the additional identified requests for development by a village community. Among the so far 11 possible projects/programs included in the "Family of 4 PLUS" HCD concept, some of the more often identified needs are:

- High-altitude greenhouses
- Solar driers for better food conservation
- Slow sand water filters in homes
- Non-formal education programs for women and out-of-school girls
- Nutrition programs for children <5 years of age and their mothers
- Hot water community shower center
- Carpentry training
- Cloth stitching training

The "Family of 4 PLUS" is an optional, additional program with a more flexible structure compared to the "Family of 4", which addresses basic daily needs. Within the "Family of 4 PLUS" only the projects/programs identified as needed by the community are implemented.

The "Family of 4" and "Family of 4 PLUS" concepts, with their projects/programs implemented respectively in concert with each other, or sequentially, enable inherently synergistic benefits, as they address the most relevant, self-identified needs for the end user community. These possible synergistic benefits are reinforced through RIDS-Nepal's >20 years practical experience and presence in the high-altitude Himalayan village communities they partner with in the "Family of 4" and "Family of 4 PLUS" projects. Synergy is defined by the online Cambridge dictionary as the *combined power of a group of things when they are working together that is greater than the total power achieved by each working separately*, and this is considered as the definition for the present research of the possible synergetic benefits of complimentary implementation of the "Family of 4" and "Family of 4 PLUS" projects. The synergistic benefits we want to identify and define in this work will be additional, a priori non-expected positive effects arising from the fact that several projects are implemented together in a community, which is central in the concept of Holistic Community Development.

But how are synergistic benefits, enabled through an HCD project approach, perceived, identified and

quantified? Synergy is an abstract concept and often strongly subjective through observations and personal user testimonies. In order to bring more clarity and understanding, the following is a brief narrative explanation of the benefits brought forth by each item of the “Family of 4”. Next, some examples of tangible synergies, experienced in the villages where RIDS-Nepal works, are identified.

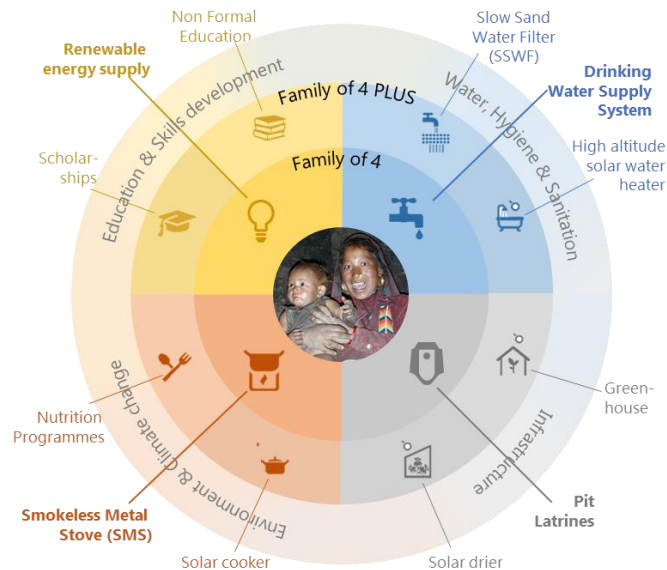


Fig. 1: “Family of 4” and “Family of 4 PLUS” Holistic Community HCD) concepts, inherently enabling synergistic benefits

Pit latrines:

Having a pit latrine for each household means there will be no more open defecation and thus no more human faeces on the village paths, fields and nearby river beds. People and animals are safe from direct contact with faeces, which will avoid the transmission of illnesses and infections. The village will be much more hygienic overall. When the septic tanks (after 7-8 years for an average family) are emptied, the composted leftover can be used as fertilizer for the fields. In terms of comfort, having a pit latrine for each family at/near home will be much more comfortable for people than open defecation, with no intimacy, wild animals and adverse climatic conditions. In the latrine there is water available for cleaning as the village drinking water system is an inherent part of the “Family of 4”.

Smokeless metal stoves:

Contextualized stoves; e.g. with a defined combustion chamber with a door and an adjusted air flow, an exhaust pipe, able to cook the local, traditional food of the users, as well as provide other energy services such as room heating (if needed) etc.; provide a much cleaner way of cooking and heating compared to open fires or poorly designed and wrongly used stoves inside the house. Respiratory problems and many other diseases can be very severe in cases where people still use open indoor fires for their energy services, spending hours cooking on it and assembling around it for long time periods during the harsh and long winter months. Addressing all these issues, RIDS-Nepal’s context relevant developed smokeless metal stove also incorporates a 9-litre stainless steel water tank, designed to heat water for hygienic purposes and consumption. The smokeless metal stove provides therefore a huge overall health improvement (respiratory health, eye and heart diseases, personal hygiene etc.) besides consuming up to 60 % less firewood, important especially for women and young girls who will not need to collect as much firewood. Further, significant lower firewood consumption of the smokeless metal stove has direct positive environment impact, such as emitting 60 tons less CO₂ in 10 years (Climate Stewards, 2019), saving top soil, hence preventing erosion and landslides, among others.

Basic electric indoor lighting:

Indoor lighting provides the chance for families to get engaged in more beneficial and productive

activities more comfortably. E.g. children will be able to do their homework and adults will be able to do their chores more easily, have more social gatherings inside their homes after dark and can start new, economic activities. Light inside the home makes the “utilizable” hours of the day longer, otherwise people will go to sleep because there is not much else they can do, especially in winter, when the sun sets early. Benefits for the eyes, respiratory system, heart, personal hygiene etc., are just some of the additional benefits basic indoor lighting enables.

Access to clean and sufficient drinking water:

A village drinking water system enables access to clean and sufficient water from a local water source tapped into and piped underground down to the village tap stands. This way, each family has easy access to their clean and sufficient drinking water demand, use in and around their home, such as for cooking, personal hygiene for all family members, cloth washing, animals, greenhouses etc., relieving women from having to go and fetch potentially contaminated water (i.e. from dead animals and villages which are up-stream) several times a day from the river.

Example of identified synergistic benefits from a latrine and a stove:

A synergistic relationship between a latrine and a stove is enabled by the use of the latrine as a place for showering with the warm water from the stove, as in the homes in these villages there is no room dedicated for personal hygiene. This way personal hygiene can be made with intimacy and with warm water, that will make people be more prone to wash themselves more often, improving their overall hygiene and health.

Example of identified synergistic benefits from a smokeless metal stove and indoor lights:

Lightbulbs used in an indoor environment with open fires or poorly/wrongly used stoves are covered by soot. Using the smokeless metal stoves properly eliminates smoke inside the house and therefore lightbulbs are kept clean. Together, the lack of smoke thanks to the stoves and the clean lightbulbs provide a much better indoor air quality resulting in significantly improved respiratory health, enabling clear vision inside the house, improving ocular health and enabling family interaction with each other and general household activities with more comfort and ease, beside increasing overall wellbeing of people.

Example of identified synergistic benefits from a latrine and indoor lights:

Both create health improvements separately (for environmental, intestinal, respiratory and ocular health), so the effect of both together results in overall even more improved health, environment and living conditions for the user, more than the sum of their individual benefits would be.

Example of identified synergistic benefits of a latrine, stove and access to clean and sufficient water:

Having water easily accessible will make people want to use a bigger part of it for hygiene (after fulfilling the priority needs which are cooking and drinking), because there will be more water available for “secondary” uses and applications. Therefore, having a functional village drinking water system makes people want to have water inside their latrines to clean themselves and the latrine. If there is no water easily available in the village, no water would be used in the latrines for cleaning and hygienic purposes. People (especially kids) would defecate and not clean themselves nor the latrine afterwards. Thanks to the stoves and the water system, they can use the water tank incorporated in the stove to have warm water for showering, thus improve their hygiene. Cold water in winter, in particular in the high-altitude areas in Nepal, is not very appealing for personal hygiene, but if it is easily accessible and warm that aspect will improve.

5. Octave assessment tool

With the goal to qualify and quantify abovementioned synergistic benefits of an implemented “Family of 4” HCD project in an objective, qualitative and descriptive way an assessment program for the open source programming language Octave was written. The program was developed and written by the author, based on RIDS-Nepal’s extended, practical field project experience, the author’s own surveys and

interviews with users in several villages who have been part in a “Family of 4” HCD project in partnership with RIDS-Nepal and in villages who have not yet been part.

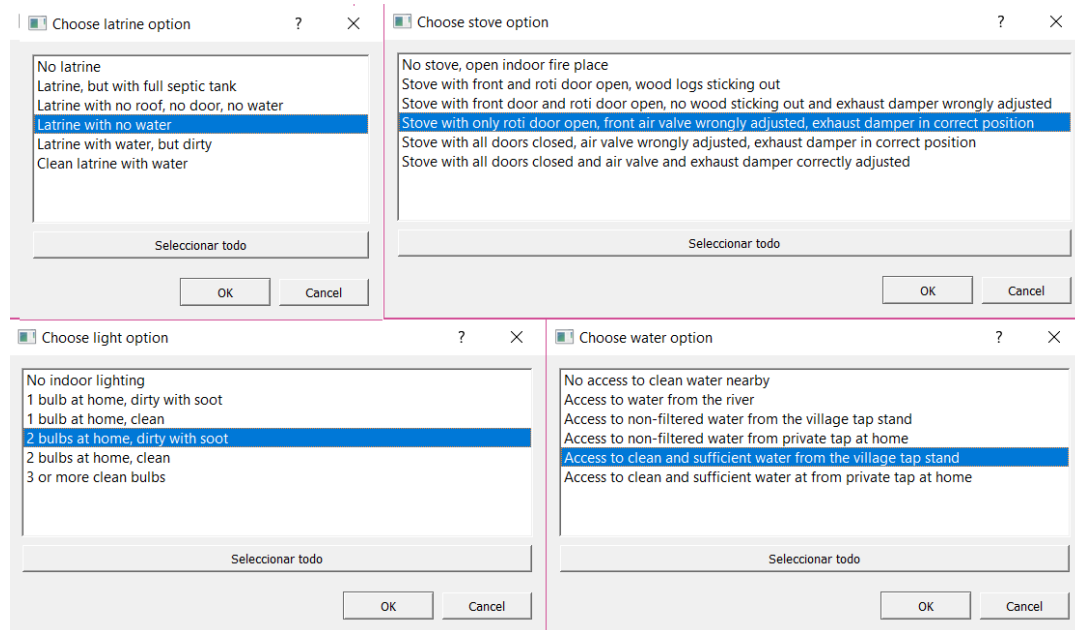


Fig. 2: User defined situation and condition of their implemented “Family of 4” through 6 different options each as input for the simulation results achieved in Fig. 3

The program takes 4 variables that the user chooses by clicking on an interactive menu; these 4 variables are the level/correctness of use of the pit latrine, smokeless metal stove, indoor lighting and access to clean and sufficient water. There are 6 options to choose from for each of these 4 variables, from the worst case (lack of the item) to the best (where the item is correctly and effectively used) and 4 more scaled options in between.

The idea behind this tool is that users of the program are able to assess possible synergistic benefits through a defined menu input of the real conditions and use of the pit latrine, smokeless metal stove, indoor lighting and access to water in the village which had a “Family of 4” HCD project implemented. Based on the 4 parameters defined for the latrine, stove, light and water access, the program calculates the indicators of health, hygiene and wellbeing of people in the community. The 3 indicators for health, hygiene and wellbeing are assigned a value between 0 and 5, called “synergetic effect”, with 0 being no effect and 5 being maximum synergistic benefits from the simultaneously implemented HCD project “Family of 4”.

The formulas implemented for the estimation of the indicators are linear equations:

$$Hygiene = latrine * 0.35 + stove * 0.15 + light * 0.15 + water * 0.35; \quad (eq.1)$$

$$Health = latrine * 0.25 + stove * 0.3 + light * 0.2 + water * 0.25; \quad (eq.2)$$

$$Wellbeing = latrine * 0.2 + stove * 0.3 + light * 0.3 + water * 0.2; \quad (eq.3)$$

The descriptive evaluation of the conditions for the *latrine*, *stove*, *light* and *water* are input by the user through the user interface in the form of text options. The program transforms the 4 input conditions into numerical quantities (from 0 to 5). The multiplying factors (0.35, 0.15, etc.) chosen sum up in all cases to 1.0, as they are taken as “weights” of the 4 variables for the respective indicators. For example, based on practical experience we defined that *latrine* and *water* are the most important factors for the indicator “hygiene”, therefore, they have a weight of 35 % each, more than *stove* and *light* have. The same rationale serves for health and wellbeing, weights have been given to the variables depending on their importance in the specific indicator they are affecting. The formulas reflect RIDS-Nepal’s long-term field observations and end users’ testimonies of implemented “Family of 4” HCD projects.

From these values another formula included in the program calculates people’s estimated productivity, which serves as basis to calculate the potential change in GDP in the mountain area in Nepal.

$$Productivity = 30 + ((14.001) * (0.2 * Hygiene + 0.6 * Health + 0.2 * Wellbeing)) \% \quad (eq.4)$$

We defined that “productivity”, even for the worst case scenario, would always have a minimum value of 30 % because people will be able to work also without latrines, stoves, lights or water. Therefore, productivity varies between 30 % (worst case) and 100 % (best case). Health weighs in with 60 % in the formula, with hygiene and wellbeing having each 20 %, as field project experience shows that health is the most important of the 3 indicators for peoples’ability to be productive in their work. The factor 14.001 is a “scaling up” factor because the output values for “Hygiene”, “Health” and “Wellbeing” range between 0 and 5, but for productivity values the scale needs to be changed to a range from 30 to 100. This factor enables the translation from one range (0-5) to the other (30-100).

Lastly, the estimate for potential GDP change in the mountain area in Nepal is estimated by assuming the whole mountain population (6.3 % of the total population (NepalMap, 2011)) lives in similar conditions to those in the 4 villages in the Chaudabise Valley in Jumla district, where data were collected in 2019. This estimate reflects therefore a hypothetical situation where the selected parameters are true for the whole mountain population in Nepal. National GDP share of the mountain area in Nepal is 5.6 % (Sapkota, 2014). The program adds or subtracts to that value depending on if the productivity is higher or lower than 65 %. If higher than 65 %, the program will compute as following:

$$5.6 \% + (Productivity * 0.01) \quad (eq.5)$$

If lower than 65 %, the formula for the potential GDP in the mountain area is computed as following:

$$5.6 \% - \left(\frac{10}{Productivity}\right) \quad (eq.6)$$

The formula for the potential GDP in the mountain area is based on our approximation. An example of a possible result of the program for a defined input of the 4 parameters is shown in the following figure

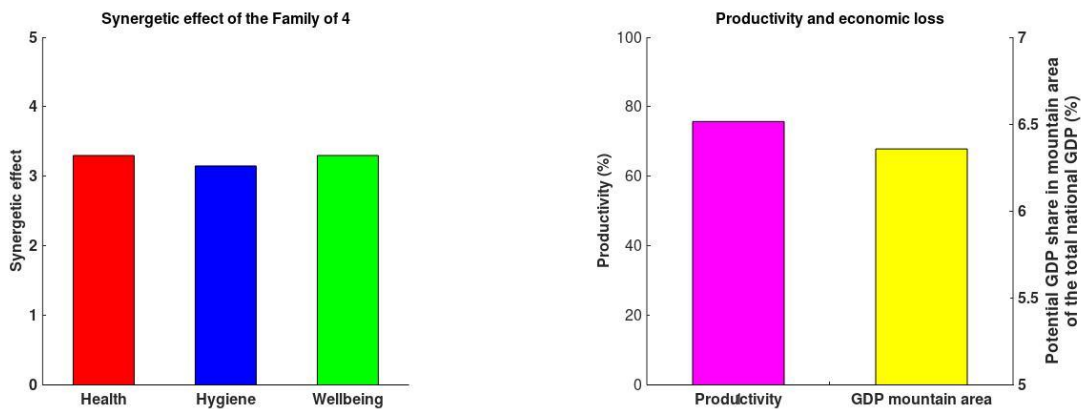


Fig. 3: Outcome plots for synergistic effect in health, hygiene, wellbeing. Productivity and GDP are estimated from these.

The interpretation of results is a narrative text which explains in detail the synergistic effects for health, hygiene and wellbeing in qualitative terms for the specific inputs of the 4 variable parameters selected. The tool provides the interpretation below the graphs. For better readability in this paper the interpretation of the calculated results pictured in figure 3, we add the descriptive narrative of the synergistic benefits achieved through the defined input parameters as text in the following paragraph:

HEALTH: Synergistic effect in health is 3.3. The effects of the selected combination will have an observable positive impact on health. Current latrine, stove, light and water use enhances health by a large amount, but still their use could be improved. Clean latrines close to home will be important to eliminate open defecation and decrease intestinal diseases. Having water inside the latrine for personal hygiene is also important regarding health. The correct use of the stove will as well create very positive

impact in respiratory health, avoiding exposure to indoor air pollution. If the stove is used correctly (closed door and correct adjustment of air valve and exhaust damper), smoke would be totally eliminated inside the house. Good lights will avoid the burning of jarro (resin-soaked pine wood), contributing to better respiratory health. However light bulbs should be cleaned if they are covered with dirt or soot to increase their luminosity. Access to clean drinking water has significant positive impact for people's health. Clean and sufficient water is essential, and if it is easily available it can be used for agriculture and animal husbandry, therefore better nutrition could be achieved as well.

HYGIENE: Synergistic effect in hygiene is 3.15. The current situation described by the selected parameters will enable an observable positive impact on people's hygiene. A latrine in good state with clean water available is essential for enhanced hygiene, and it will avoid people practising open defecation because it offers a private and hygienic environment. The cleaner the latrine and the better its condition, the more likely people will make use of it. A stove which is well utilized, by closing the doors, air valve and damper, will largely reduce indoor air pollution, therefore eliminating soot particles. That will contribute to enhance people's hygiene and indoor environment. A complete elimination of smoke is important for hygiene. Good lighting will avoid burning jarro (resin-soaked pine wood) and decrease smoke too. Easy access to clean and sufficient water will bring very positive impact on hygiene too, because plenty of water will be available for hygiene purposes.

WELLBEING: Synergistic effect in wellbeing is 3.3. Selected parameters will enable conditions for a significant improvement in people's wellbeing. The fact of having a latrine near the house will largely increase comfort and offer a private and safe place for defecation, avoiding people having to go to the forest. A latrine with water will therefore make a big positive impact in wellbeing, and it could be improved by keeping the latrine clean and with water always available. Correct use of the stove will decrease smoke indoors, having evident positive impact for wellbeing, making the house much more comfortable to live in. The time needed for firewood collection will also be shortened, as the stove enables a more efficient burning, using less wood. Clean light bulbs will allow people to spend longer time inside the house in the evening to be with family and kids could be able to study indoors, which is not possible with no indoor lighting. Accessible safe water will as well increase people's wellbeing, as they will have plenty of it available for cooking, drinking, hygiene and agriculture. If the water source is near the house, or even better, in the house, people will not need to walk far to get it, as it is the case in some areas. Easy access to clean water will have a large positive impact in wellbeing.

Productivity is 75.78 % out of a possible maximum of 100%. Productivity is the ability of people to work efficiently, and the selected parameters will potentially enable conditions for it to be high. People's health is the most important parameter for estimating productivity, especially in areas where agriculture is the main economic sector. The current situation is therefore very good to enable a proper framework for people to be healthier and be able to work in an efficient way.

Potential national **GDP** share of the mountain area in Nepal is 6.36 %. National GDP share of the mountain area in Nepal is 5.6 %, much smaller than the Hill (central) and Tarai (south) regions. Considering the productivity estimated with the selected parameters, GDP share is expected to raise. With the selected parameters the productivity of people will be very high, because of improved living conditions and a better framework for work and production. This estimate reflects a hypothetical situation where the selected parameters are true for the whole mountain population in Nepal. Potential GDP share is estimated by assuming the whole mountain population (6.3 % of the total population; source: 2011 Nepal National Census) lives in similar conditions to those in the 4 villages in the Chaudabise Valley in Jumla district, where data were collected in 2019. This estimate reflects therefore a hypothetical situation where the selected parameters are true for the whole mountain population in Nepal.

This program is particularly designed, and based on the survey and interview data collected, for the context of the remote north-western part of Nepal, assessing RIDS-Nepal's implemented "Family of 4" HCD program. The software program developed for Octave is applicable for other people groups, regions and developing countries if the needed contextualization for culture, habits and technologies of the target people group are correctly assessed and appropriately included in the underlying program structure.

6. Conclusions

RIDS-Nepal has been involved in community development projects in the districts of Jumla and Humla since 1996. Sustainable development projects are not easy to design and implement, especially in these remote and impoverished areas where illiteracy rates are still very high (45 % illiterate in Jumla and 52 % in Humla (NepalMap, 2011)). RIDS-Nepal's developed HCD approach "Family of 4" involves user communities in the design, construction, operation and maintenance of all projects. That helps the beneficiaries to have a strong ownership feeling for each project and teaches them in the long run how to stand on their own feet, keeping the items (latrines, stoves, light and drinking water system) in good and functional conditions, so that they will last for many years. The next generation will be born into these new, context relevant and applicable developments, "enculturating" these applications by assimilating the "Family of 4", and for that sake as well the "Family of 4 PLUS" HCD concept easily into their everyday lives. Once that happened, the development of the targeted people group has achieved the needed local momentum to be continued by the local users themselves through full awareness, ability and skills to build and use as well as to maintain their development achievements. In literature this is abstrusely defined as "sustainability", a far too frequently, far too easily and far too often poorly and unsatisfactory defined and hastily used term which lost its real meaning over the last decades.

With Humla and Jumla being permanent food shortage areas (Kathmandu Post; 2018; HEAD Nepal, 2016), most people in these areas live from subsistence agriculture, just to survive. That makes it very difficult to implement sustainable economic growth in these areas. Education is also very low because children often go to work on the family's fields and teachers in these areas are not suitably educated, prepared and motivated either. Briefly said, poverty is a consequence of lots of aspects and circumstances, that may be geographical, climatic, cultural, environmental, etc., converging all in one place. Finding workable and practical solutions for it is one of the key questions in the field of development to achieve the SDGs fulfilment. In fact, reducing poverty is one of the biggest challenges humanity still faces today and the goal of "No Poverty" has not been chosen by accident as the 1st Sustainable Development Goal among the other 16 that we need to address and have agreed to achieve as world community until 2030.

RIDS-Nepal is one of those small organizations which, by adding their contribution through their developed long-term "Family of 4" and "Family of 4 PLUS" HCD concepts, even if small at the world scale, helps people groups in the remotest and some of the most impoverished communities in the world advance towards the fulfilment of the noble SDG goals. We have experienced and seen first-hand, and to some extent as well have shown through the developed assessment tool presented in this paper, the possible changes and synergistic benefits of end user communities who implemented with RIDS-Nepal a long-term, HCD project. Our Octave program is a first attempt to measure objectively the effect that latrines, stoves, lights and access to water have in people's health, hygiene and wellbeing, and we believe, even if the estimates can be improved, that it is a good starting point for the development of such an evaluation and assessment tool that can be potentially used in wider contexts. We have seen changed lives in the remotest areas of Nepal which were still visible and measurable after a generation, as people own the projects and the new infrastructure has been enculturated. Apart from that, the way RIDS-Nepal approaches all activities is well thought through and in close partnership with the user communities for many years (ideally 2 generations). RIDS-Nepal puts quality of services before quantity, and this is the right decision for an NGO that wants to make a real change in their little part of the world.

The author's personal contribution to RIDS-Nepal's activities has been a study and the programming of the Octave assessment tool for identifying synergetic benefits created by the "Family of 4" holistic community development approach, about the sustainability of the HCD approach and contribution to the SDGs. The Octave assessment tool can be useful in community development projects if it is contextualized and adjusted for the specific people groups to be assessed. It can give some valuable descriptive results about what the future prospective of a community will be if the "Family of 4" HCD approach is consequently implemented. There is plenty of scope and need for further research and refinement of the Octave assessment tool, in particular how subjective, user-defined experiences (Fig. 2) can be used as input for an algorithm to calculate the possible synergistic benefits in numerical values

(Fig. 3) which in turn again have to be interpreted in descriptive narrative terms for the user community. This, since the effects and impacts of latrines, stoves, indoor lighting and access to clean and sufficient drinking water have on people's health, hygiene and wellbeing in developing countries, especially if they are implemented jointly with each other, are not yet mathematically sufficient, accurately and enough detailed, researched and included in literature. That is why the Octave-based assessment tool presented in this paper is a first attempt to quantify mathematically synergistic benefits the "Family of 4" projects can bring forth, defined in qualitative terms based on the various input parameters. There is substantial space for improvement in the simple model assumed and qualitative descriptive outcome indicators in the program. But this first attempt approximates fairly well the observed, long-term empirical evidence in the form of plots and interpretation texts.

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