

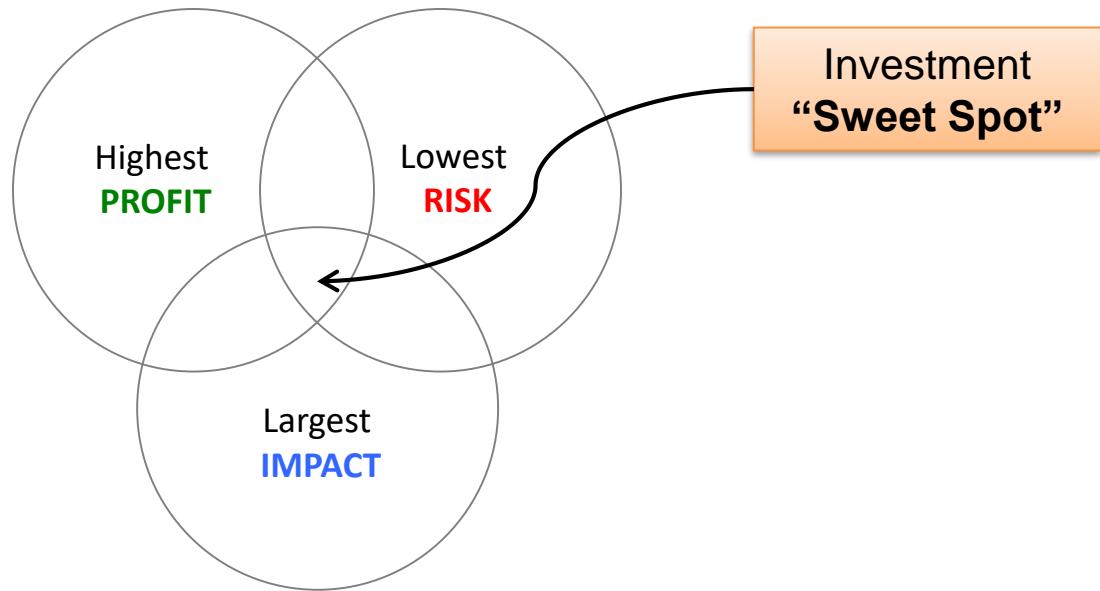


Risk Impact Profit Evaluation System

Sharon Gao, Sarah Jeong, Emma Kurz, Katarina
Svennas, Nicholas van der Vink

Identifying Opportunities ◆ Streamlining Due-Diligence ◆ Mitigating Risk

Adapting data analysis methodologies originally developed for advanced signal processing, RIPE identifies optimal impact investment opportunities.



How? Using Data-to-Decision & Weak Signal Analysis to Find the “Sweet Spot”

RIPE objectively and quantitatively integrates hundreds of factors through both geospatial and statistical analysis to streamline the due diligence process of determining successful business ventures. Through data fusion and integration, RIPE can detect and amplify “weak signals” – characteristics that are not readily apparent in any single set of factors but that are predictive of highly successful impact investments.

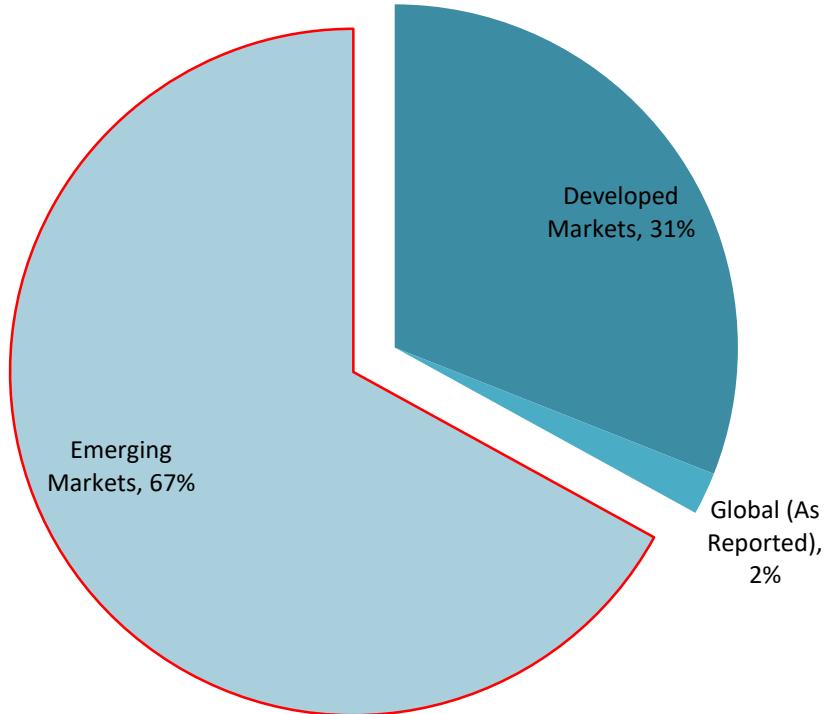
Impact Investment “Sweet Spot” in Emerging Markets

- In order for impact investment to promote economic development, must overcome hurdles of risk assessment, particularly in emerging markets
- “People have started to notice that private enterprise can help the poor as much as charities can. Sometimes even more.” - Boston Globe, Jan 7th, 2014
- Key: achievement of social goals will not be a secondary priority of business – it will be a primary aspect integrated into fabric of the venture.

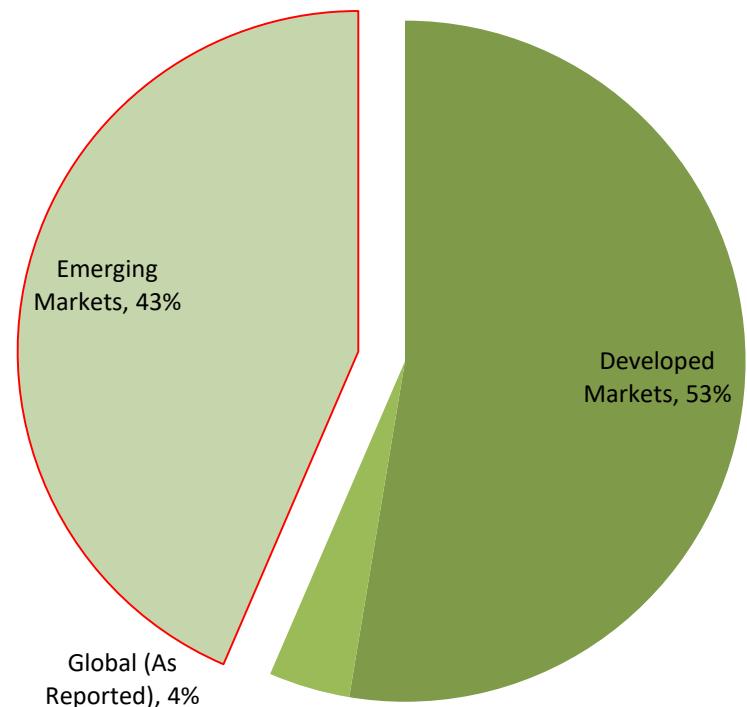


Impact Investing Market

**Distribution of Impact Investments
by Number of Investments**



**Distribution of Impact Investments
by Cash Flow (USD, mm)**



Data Sourced From:
“Insight into the Impact Investment Market” : *Social Finance* 14,
December 2011
J.P. Morgan
Yasemin Saltuk

Geographic Distribution of Impact Investments in Emerging Markets by Number of Investments

Emerging Markets (As Reported), 4%

Middle East and North Africa, 2%

Eastern Europe, Russia, and Central Asia, 16%

South and Southeast Asia, 16%

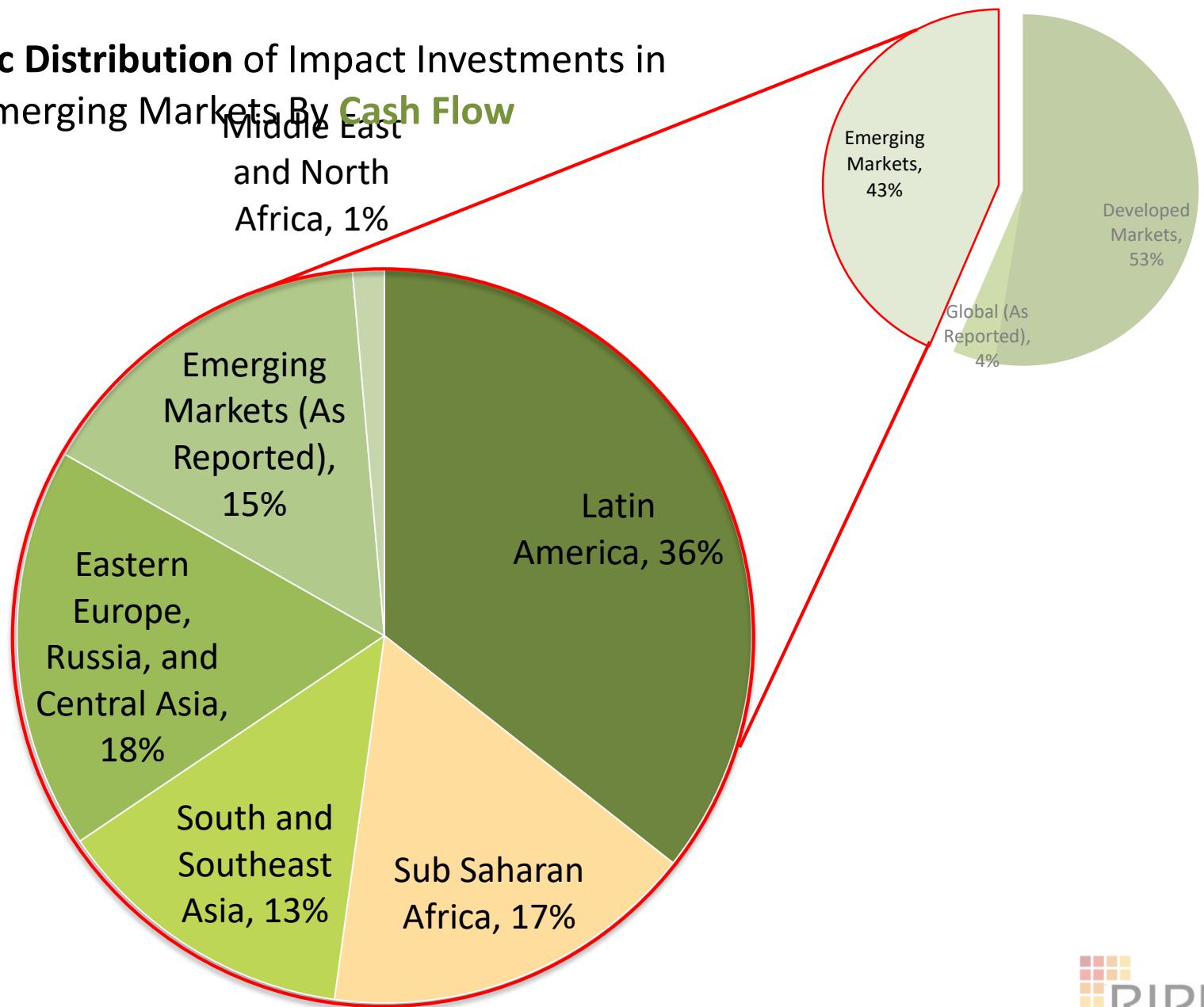
Sub Saharan Africa, 18%

Latin America, 44%

Emerging Markets, 67%

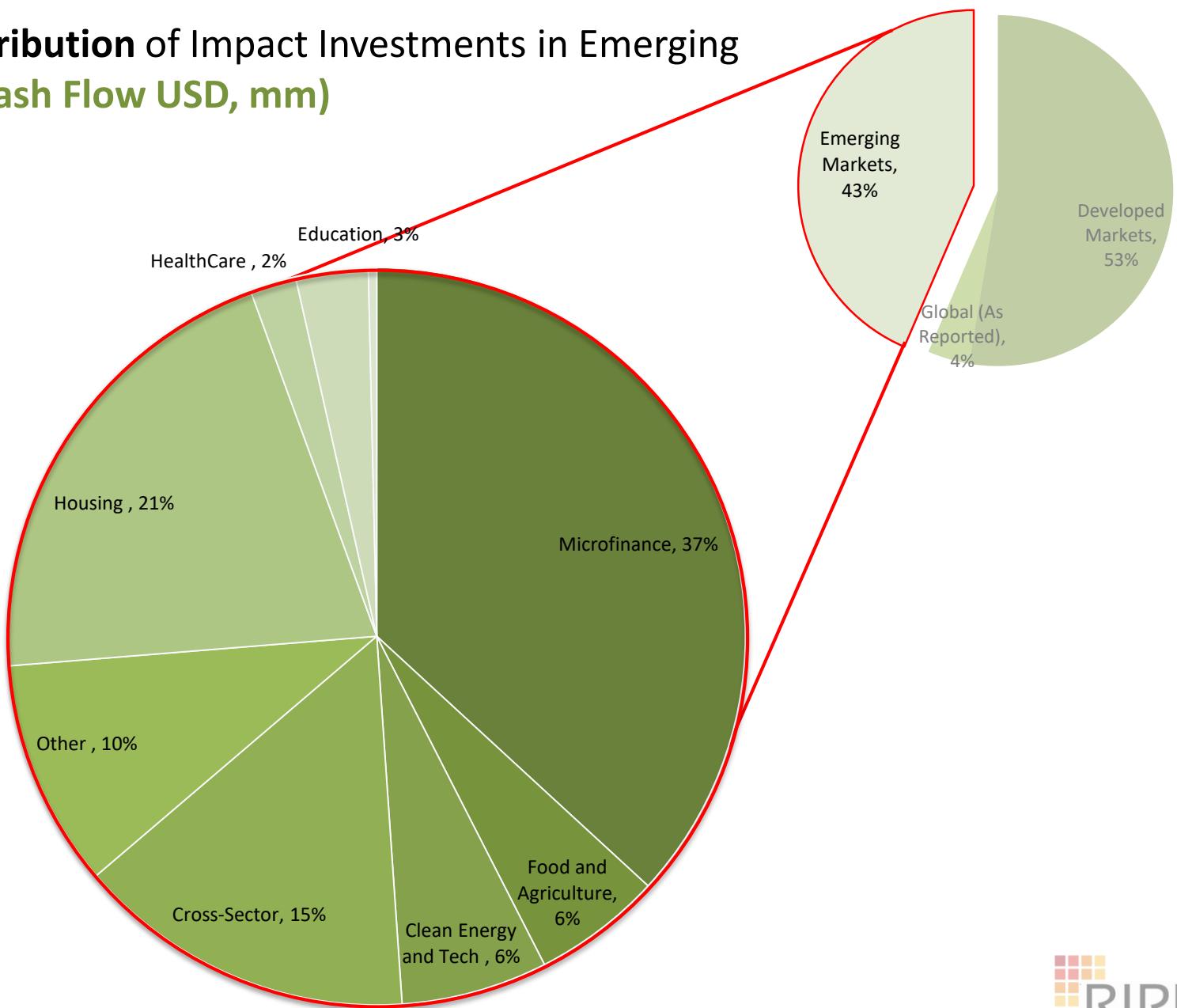
Distribution of Impact Investments by Number of Investments

Geographic Distribution of Impact Investments in Emerging Markets By Cash Flow



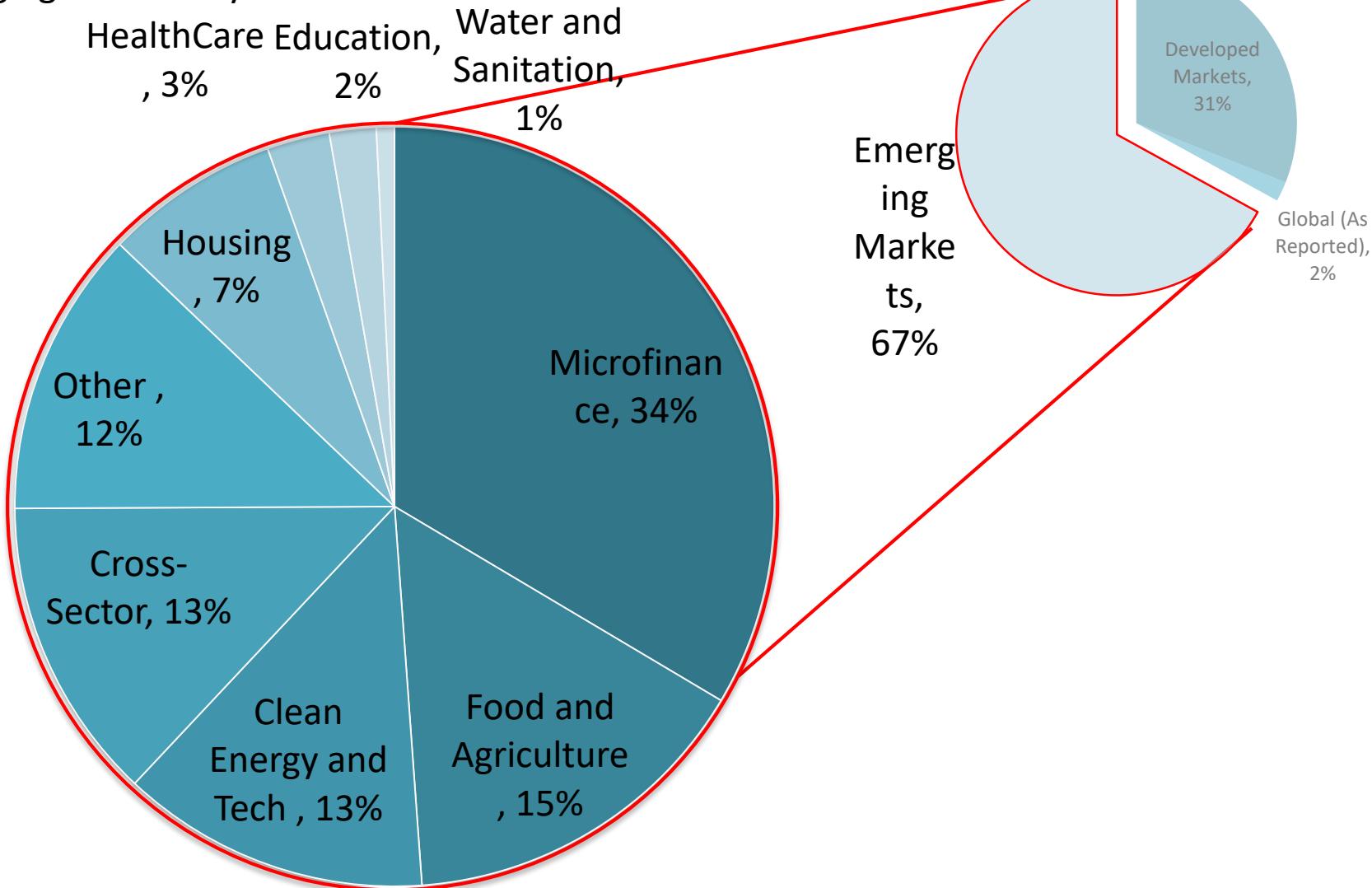
Distribution of Impact Investments by
Cash Flow (USD, mm)

Sector Distribution of Impact Investments in Emerging Markets (Cash Flow USD, mm)



Distribution of Impact Investments by
Number of Investments

Sector Distribution of Impact Investments in Emerging Markets by Number of Investments



Impact Investing Market: Distribution and Major Players

2011 reported impact investments



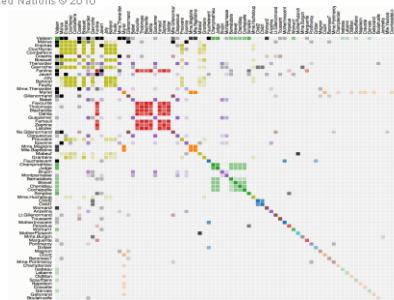
Figure Taken From: Saltuk, Bouri and Leung, Insight into the Impact Investment Market, 2011

Overview of Methodology



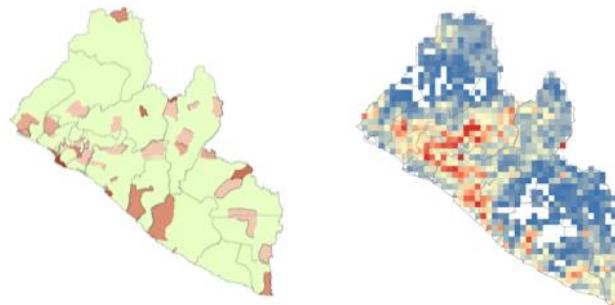
United Nations © 2010

Step 1. Defining impact goals of investment



Step 2. Determining the type of investment that maximizes impact by tracking MDG status

Step 3. Weak signal analysis using additional non-MDG indicators to determine the components of risk and profit



Step 4. Geo-spatial representation to determine location for profit maximization and risk mitigation



Step 5. Find the **Sweet Spot**

Step 1. Defining Impact goals of investment

- Choose desired Impact Goal:



- Fund goals
- Microfinance
 - Agriculture
 - Malaria
 - ...



- Millennium Development Goals
- Hunger and poverty
 - Education
 - Gender equality
 - Child mortality
 - Maternal health
 - Endemic diseases
 - Environmental sustainability
 - Global partnership for development



- National Priorities
- Peace Security & Law
 - Economic Transformation
 - Human Development
 - Governance and Public Institutions
 - Cross-Cutting Issues



- GIIRS
- Highest rating
 - ...

Step 2. Determining type of investment that maximizes impact by tracking MDG status

The Millennium Development Goals

Eight Goals for 2015



1 Eradicate extreme hunger and poverty



2 Achieve universal primary education



3 Promote gender equality and empower women



4 Reduce child mortality



5 Improve maternal health



6 Combat HIV/AIDS, malaria and other diseases



7 Ensure environmental sustainability



8 Develop a global partnership for development

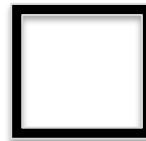
Matrix Findings



1 Eradicate extreme hunger and poverty



Improve maternal health



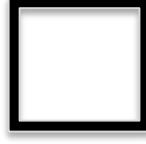
2 Achieve universal primary education



Combat HIV/AIDS, malaria and other diseases



3 Promote gender equality and empower women



Ensure environmental sustainability



4 Reduce child mortality



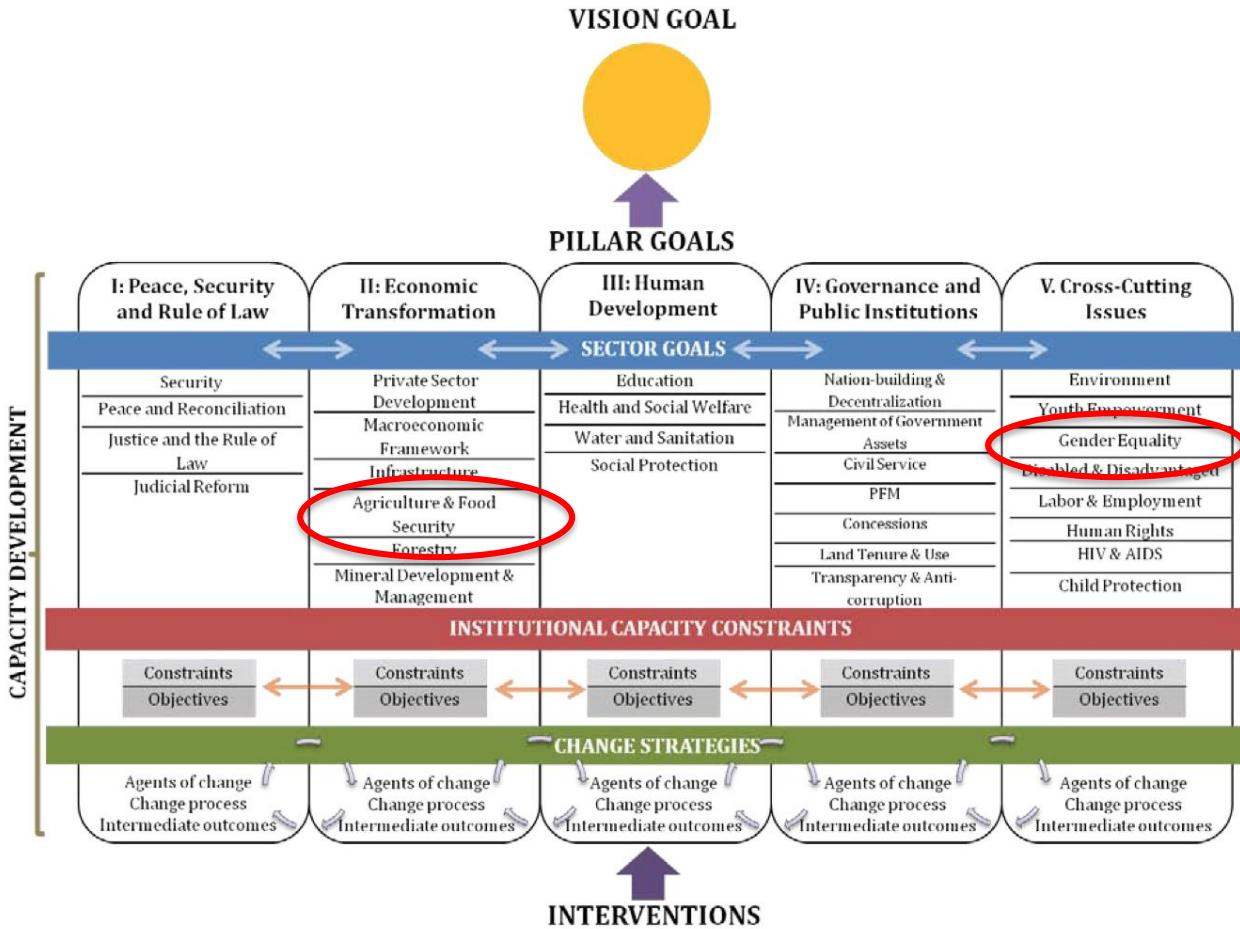
Develop a global partnership for development



Other considerations: National Priorities

- *Liberia 2030* following the Agenda for Transformation

Figure 5.2: Results Framework for the Agenda for Transformation

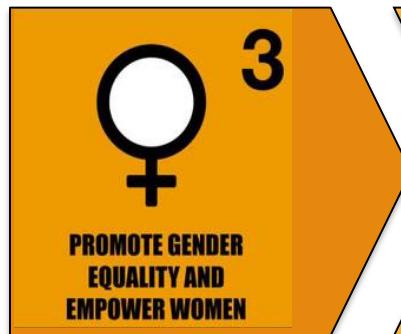


Target Indicators That Evolve from Integration of MDG Matrix & Liberia National Priorities



- Poverty Gap Ratio
- Unemployment Rate
- Share of Poorest Quintile in National Expenditure
- Percentage of Pop Living Below \$1/Day

STIMULATE JOB CREATION



- Ratio of Female to Male in Primary, Secondary, and Tertiary Enrollment
- Share of Women in Agricultural Workforce
- Share of Women in Parliament

INCENTIVIZE EMPLOYMENT OF HIGHER PERCENTAGE OF WOMEN



- Proportion of Land area cover by forest
- Proportion of total water resources used
- Proportion of population using improving drinking water source
- Proportion of pop using improving sanitation facility

VALUE ADDED NATURAL RESOURCES

Investment Decision: Goals of the Venture

STIMULATE JOB CREATION

1. Utilize Liberia's natural resources to increase added value to agricultural lands

INCENTIVIZE EMPLOYMENT OF HIGHER PERCENTAGE OF WOMEN

2. Promote incentive programs to hire certain percentage of Female employees

VALUE ADDED NATURAL RESOURCES

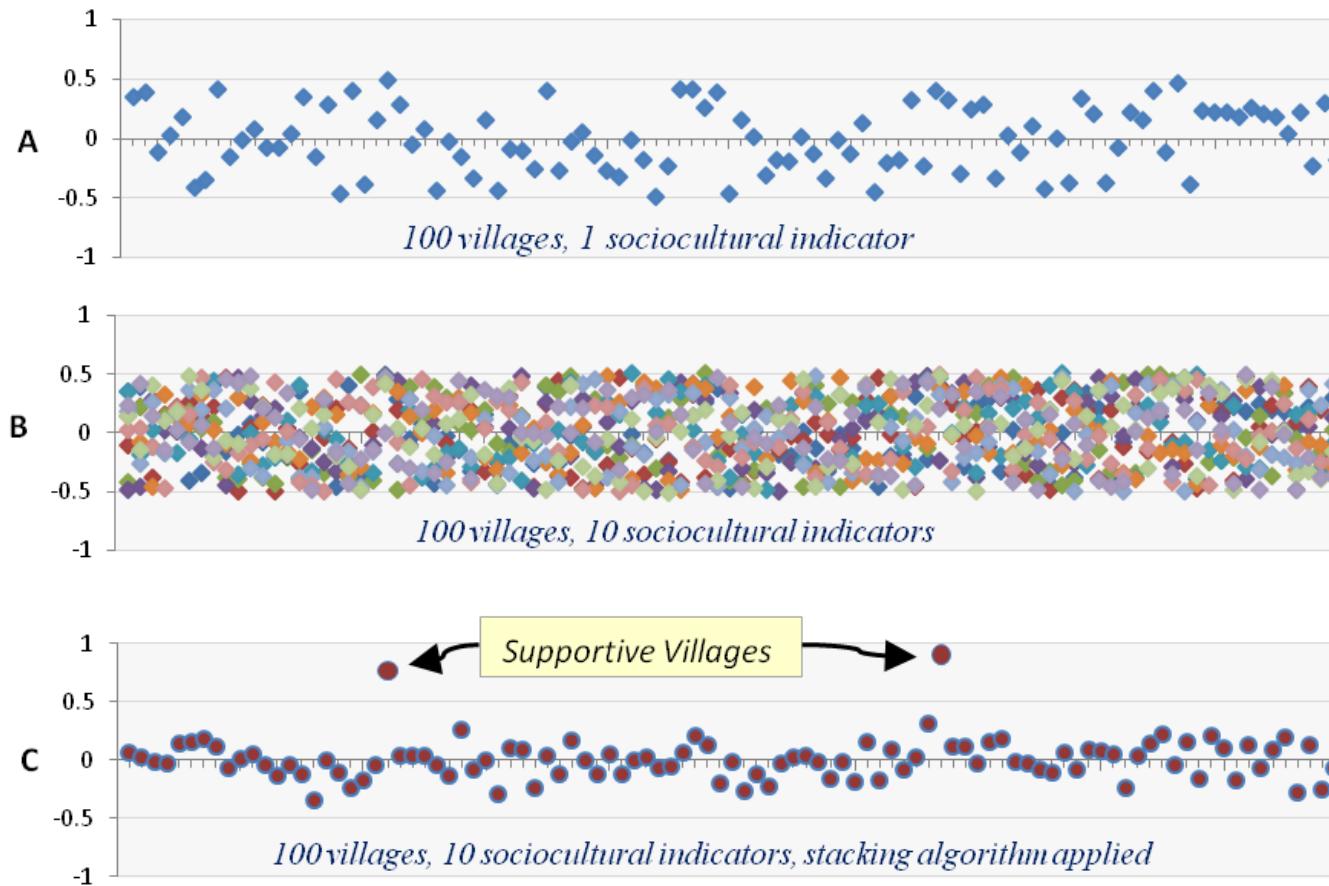
3. Create stable revenue stream for individual's harvesting, processing, and exporting the final product

4. Liberia's Main Exports: Rubber (approx. 65%), Diamond, Gold, Iron, Timber, **Coffee**, and Cocoa (source CIA Factbook)

Proof of Concept: "Ripe Coffee"

A \$5-10 mm Investment in developing a Liberian Coffee Company

Step 3. Use additional non-MDG indicators to determine optimal geographic location for RIPE coffee



Little to no significance

Little to no significance

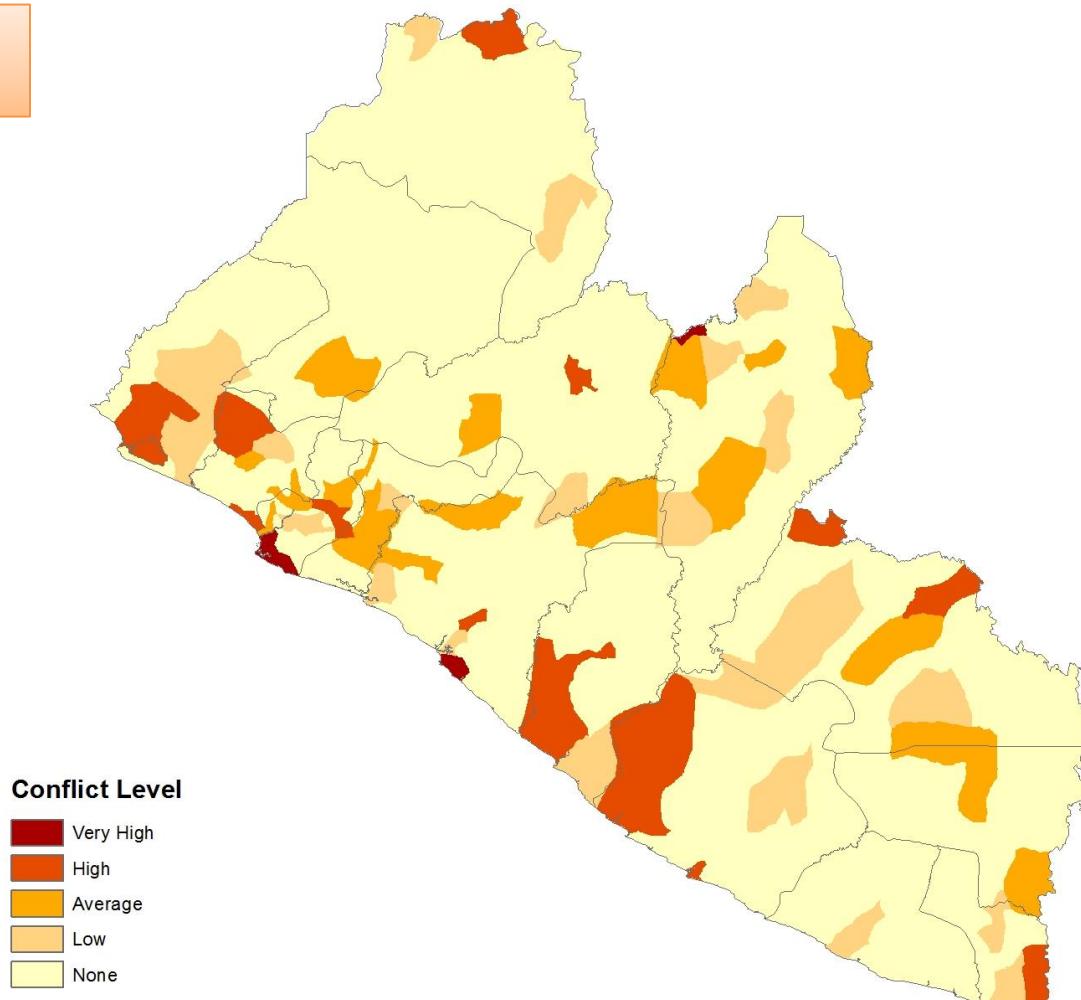
Signal emerges

Step 4. Geo-spatial representation to determine location for profit maximization and risk mitigation

- Components of Risk:
 1. Conflict
 2. Instability
 3. Land Value Risk
- Components of Profit:
 1. Market Access
 2. Cropland
 3. Labor Quality

RISK Mitigation strategy (I): Identifying post-conflict or low-conflict regions

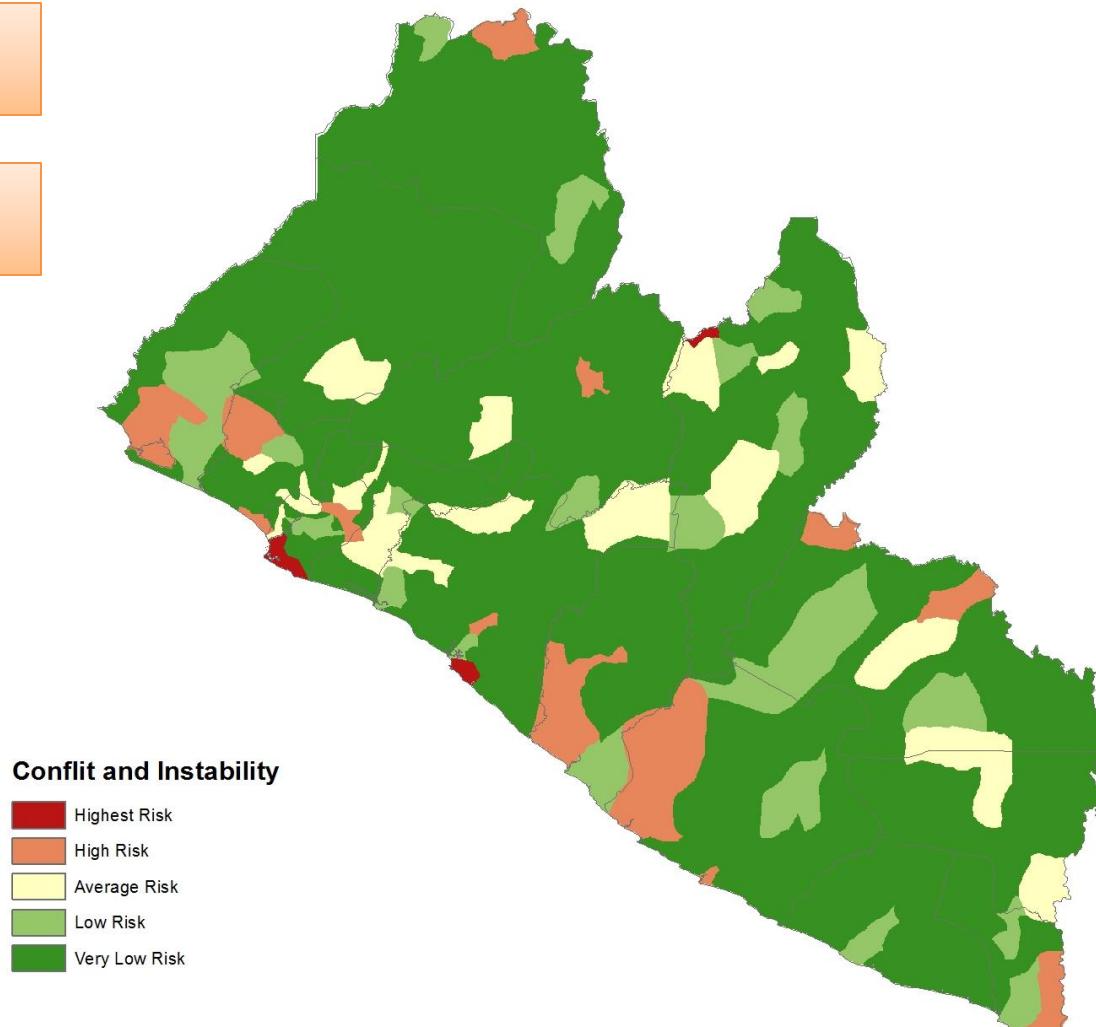
Conflict



RISK Mitigation strategy (II): Identifying low-conflict regions with high stability

Conflict

Instability

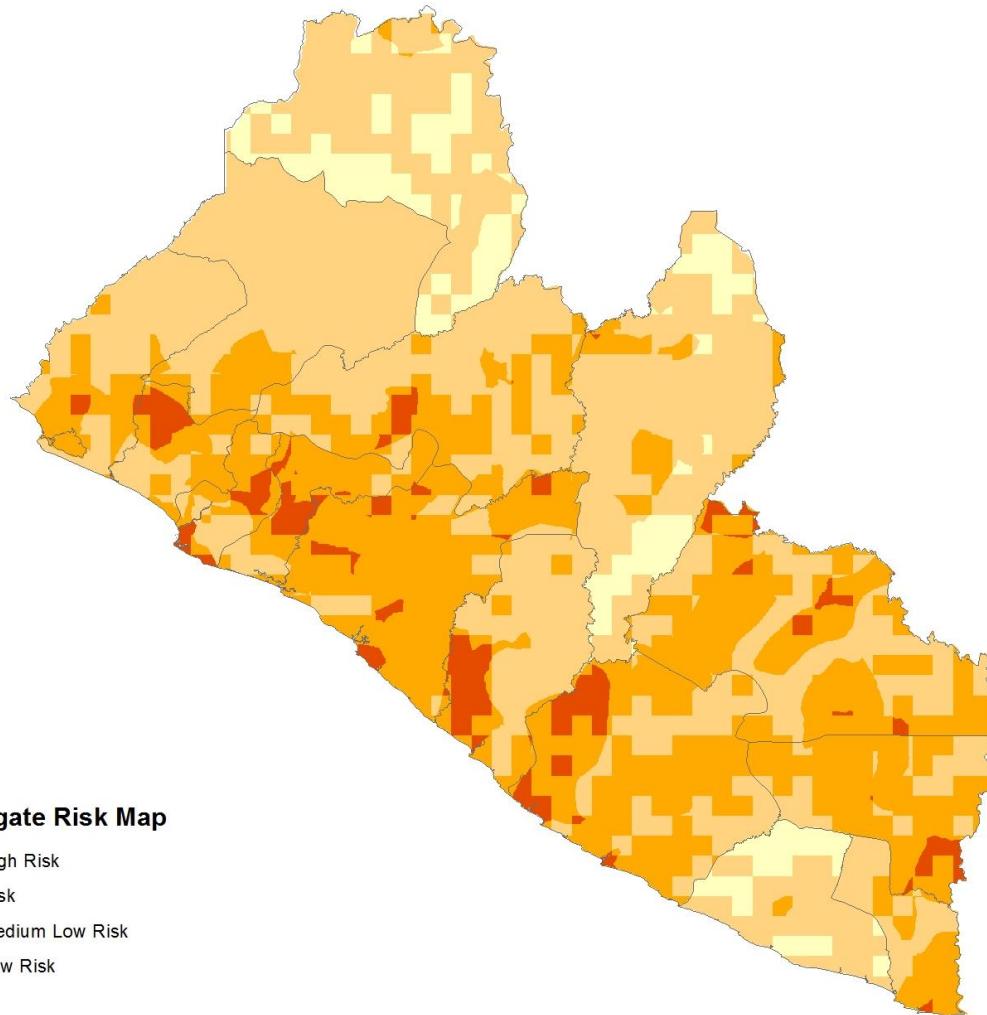


RISK Mitigation strategy (III): Identifying overall risk level of regions

Conflict

Instability

Land Value Risk



RISK Mitigation strategy (III):

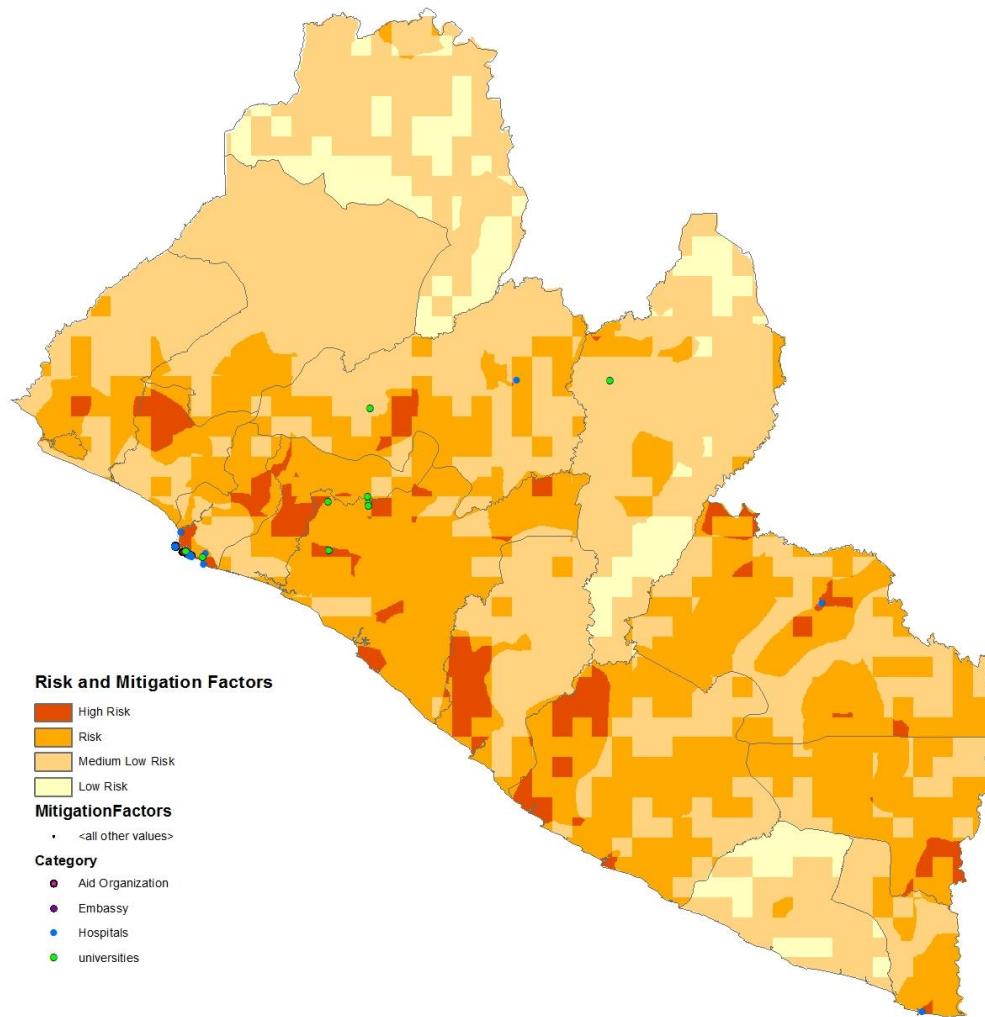
Targeting areas opportunities for alignment given risk level

Conflict

Instability

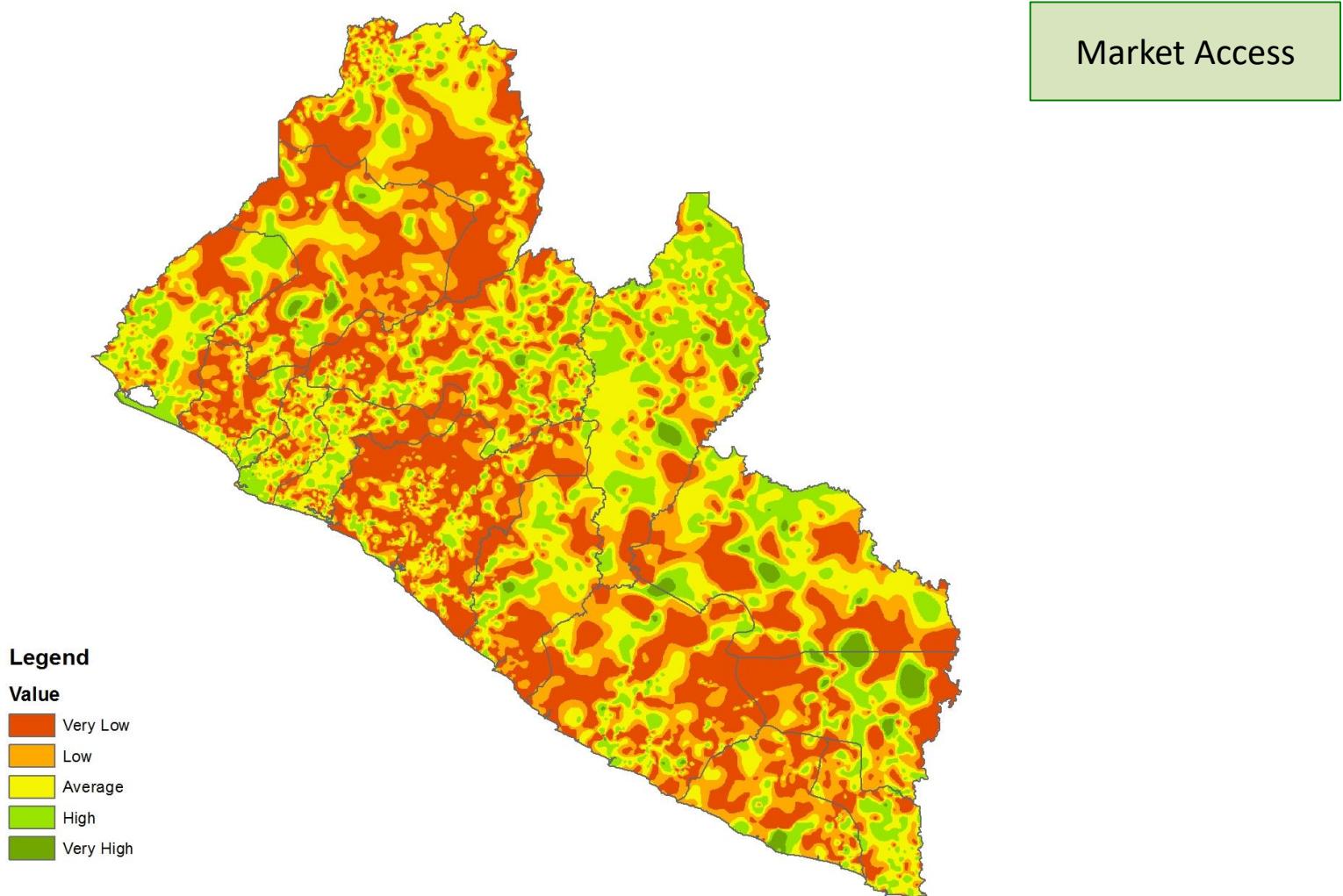
Land Value Risk

Alignment
opportunities



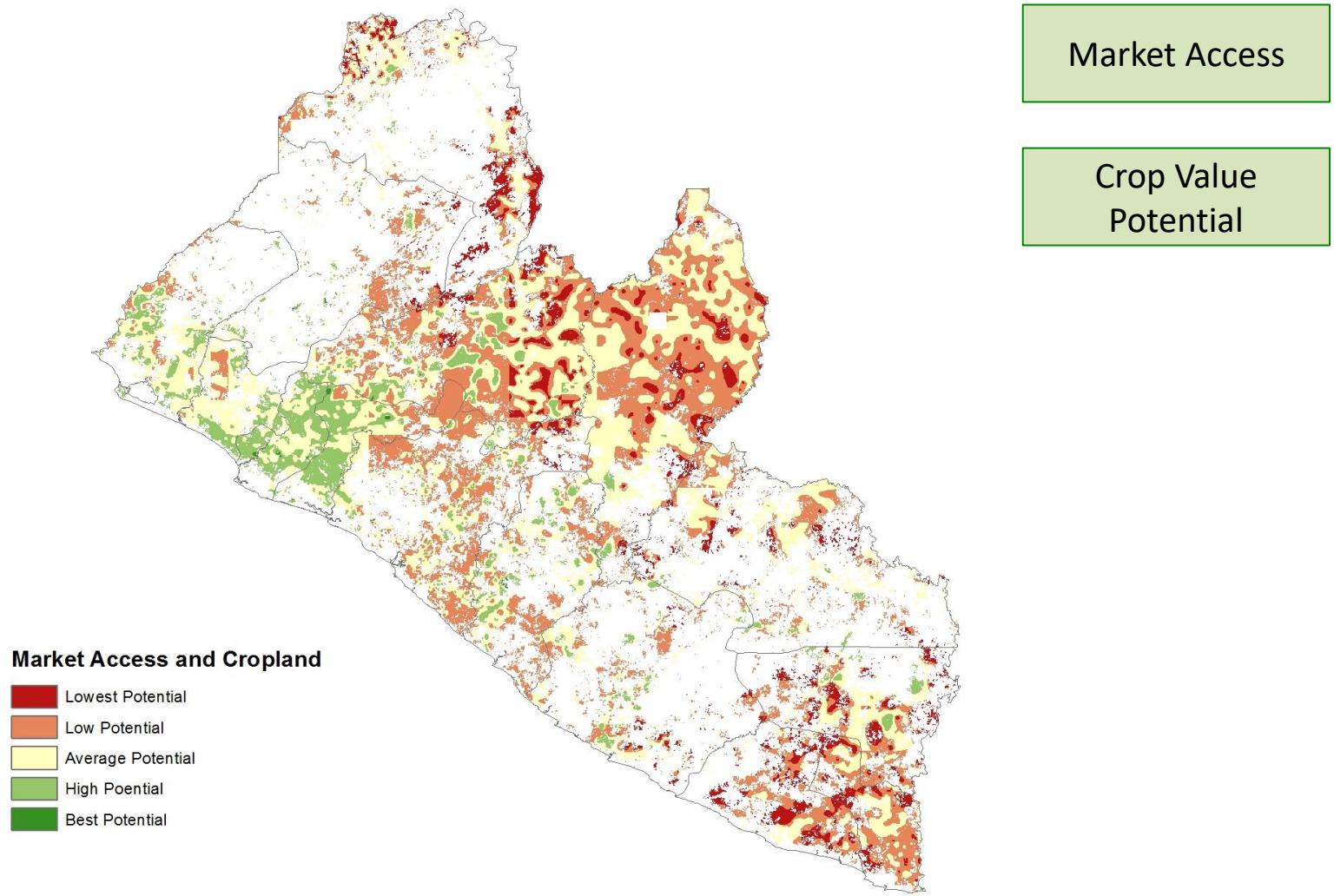
PROFIT Maximization strategy (I):

Identifying regions with easy market access

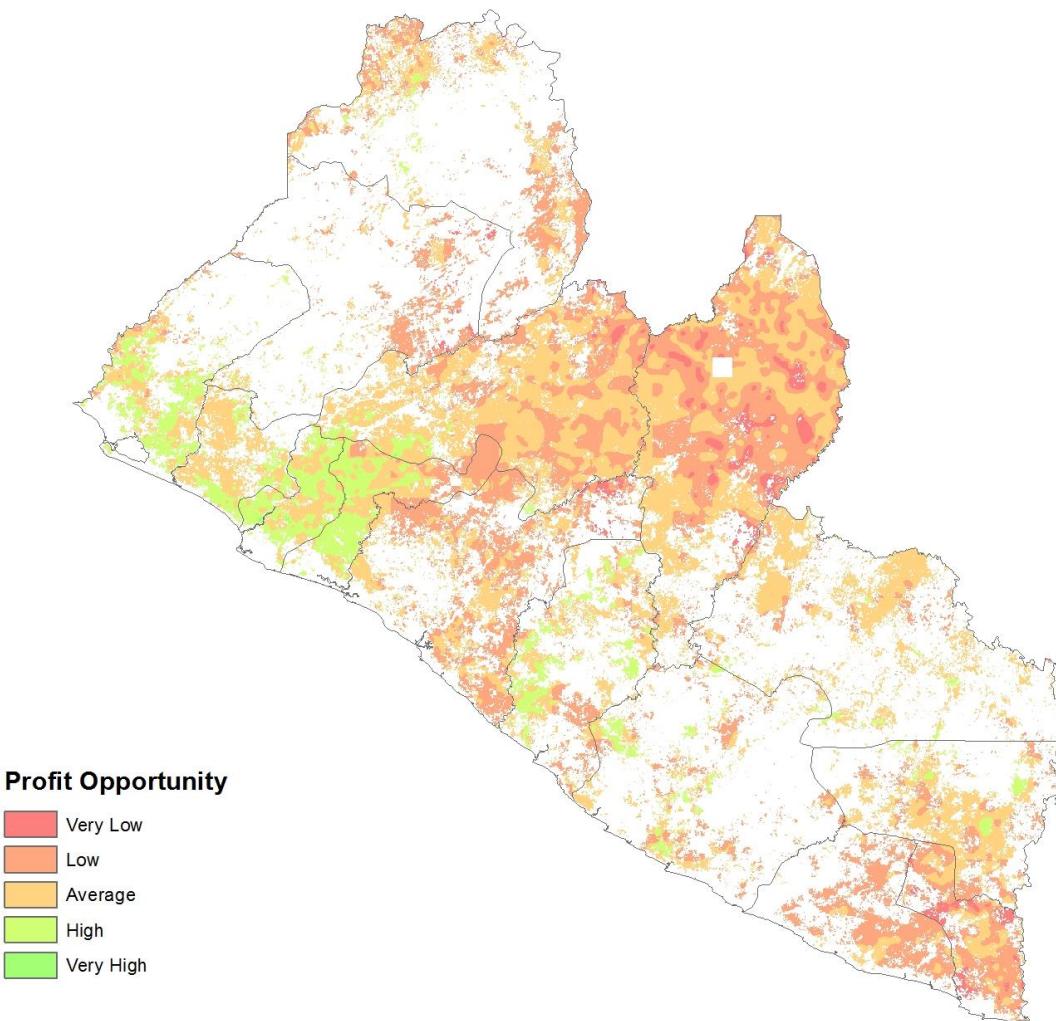


PROFIT Maximization strategy (II):

Identifying regions with easy market access & high-potential for added crop value



PROFIT Maximization strategy (III): Identifying the most profitable regions for an agricultural venture



Market Access

Crop Value Potential

Labor Quality

Finding the *Sweet Spot*



Identifying areas of low risk and high profit

Conflict

Instability

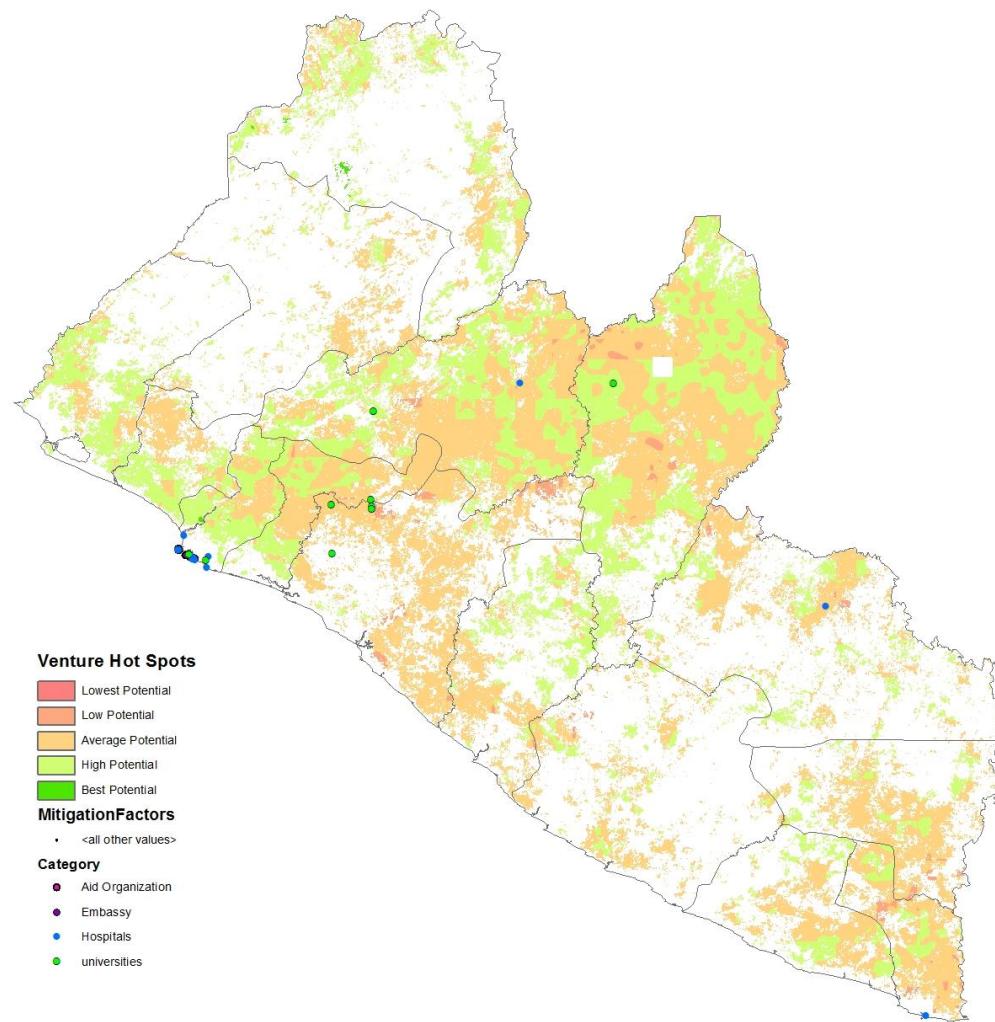
Land Value Risk

Alignment opportunities

Market Access

Crop Land

Labor Quality



Identifying high potential areas

Conflict

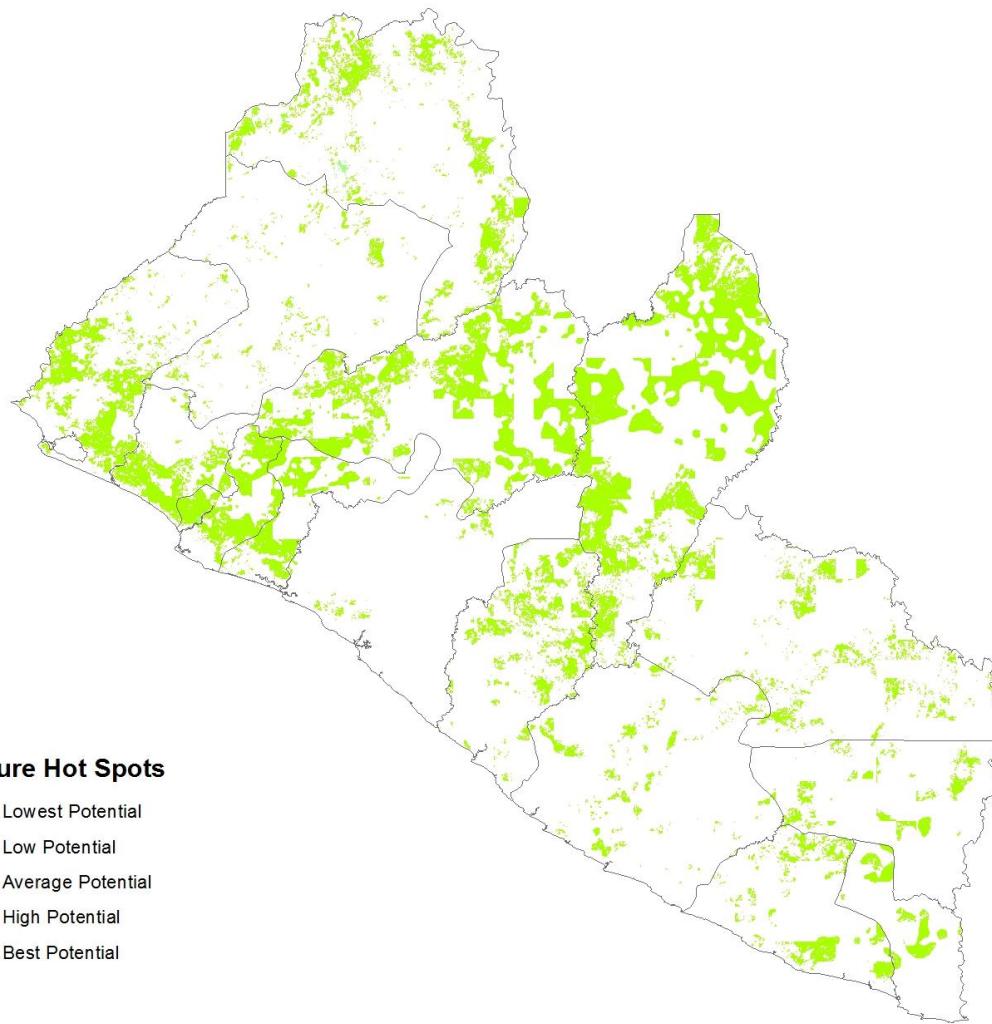
Instability

Land Value Risk

Market Access

Crop Land

Labor Quality



Venture Hot Spots

- Lowest Potential
- Low Potential
- Average Potential
- High Potential
- Best Potential

Identifying the *Sweet Spot*

Conflict

Instability

Land Value Risk

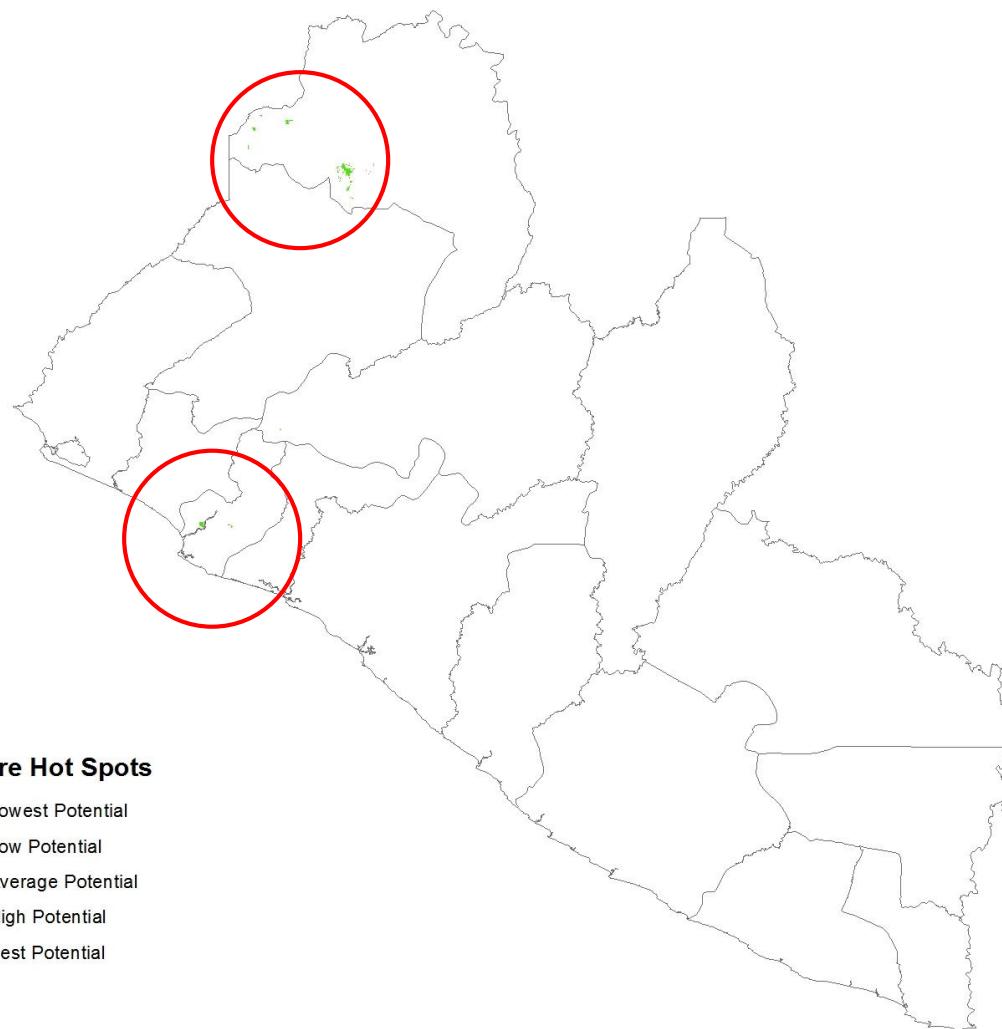
Market Access

Crop Land

Labor Quality

Venture Hot Spots

- Lowest Potential
- Low Potential
- Average Potential
- High Potential
- Best Potential

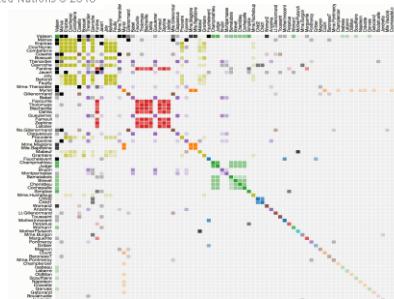


Recap of Proof-of-Concept



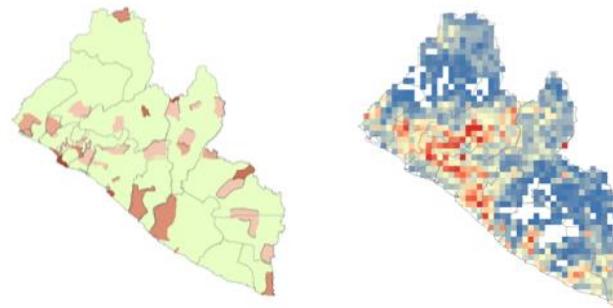
United Nations © 2010

Step 1. Defining impact goals of investment



Step 2. Determining the type of investment that maximizes impact by tracking MDG status

Step 3. Weak signal analysis using additional non-MDG indicators to determine the components of risk and profit



Step 4. Geo-spatial representation to determine location for profit maximization and risk mitigation



Sweet Spot

RIPE

QUESTIONS?

APPENDIX

Investment market data

- EM and non-EM country breakdown:

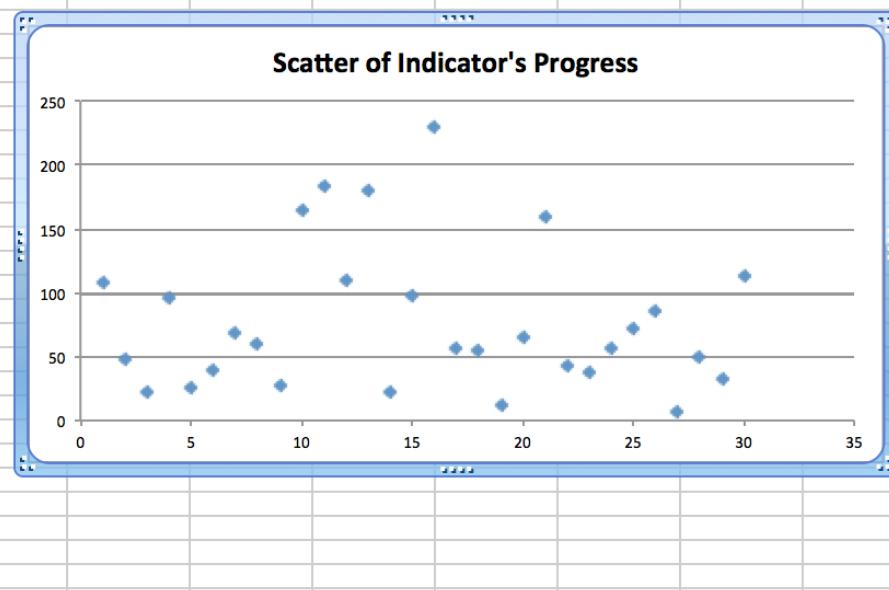
Latin America	629	30%	639	15%
Sub Saharan Africa	251	12%	297	7%
South and Southeast Asia	228	11%	240	6%
Eastern Europe, Russia, and Central Asia	227	11%	317	8%
Emerging Markets (As Reported)	52	2%	276	7%
Middle East and North Africa	34	2%	25	1%
South Pacific	0	0%	0	0%
Emerging Markets	1421	67%	1794	44%
US and Canada	632	30%	2122	51%
Western Europe	21	1%	47	1%
Australia and New Zealand	0	0%	0	0%
Developed Markets	653	31%	2169	53%
Global (As Reported)	32	2%	159	4%
Total	2106	100%	4122	100%

Matrix Supplement: Abbreviations

Goal	Indicator Name	Abbrev
1	Proportion of Pop Below \$1 (PPP)/ day	PovGap\$1.25
1	Poverty Gap Ratio	PovGapNat
1	Share of Poorest Quintile in National Consumption	Top10%IncSh
1	Employment to Pop Ratio	Unemploy
1	Prevalance of Underweight Child Under Five	MalnutUnd5
2	Net Enrollment Ratio in Primary Education	PrimEnroll
2	Proportion of Pupils starting Grade 1 Who Graduate	PrimReten
2	Literacy Rate of 15-24 Year Olds Male	MaleLit
2	Literacy Rate of 14-25 Year olds Female	FemLit
3	Ratio of Girls to Boys in Primary, Secondary, Tertiary Education	F/MPrimEnroll
3	Secondary Education	F/MSecEnroll
3	Tertiary Education	F/MTertEnroll
3	Share of Women in Wage Employment in the Non Agricultural Sector	AgrLabor%F
3	Proportion of Seats Held by Women in Parliament	ParliamentWo
4	Under Five Mortality Rate	U5Mortality
4	Infant Mortality Rate	InfantMort
4	Proportion of 1 year -old children immunized against measles	MeaslesImmu
5	Maternal Mortality Ratio	MaternalMort
5	Contraceptive Prevalance Rate	ContracepWor
5	Unmet Need for Fam Planning	UnmetNContra
6	HIV prevalance among pop aged 15-24	HIVPrev
6	Prop of pop with advanced HIV infection with access to Care	AdvancHIVTre
6	prop of children under 5 with insecticide treated bed nets	InsectNetU5%
6	prop of children under 5 with fever who are treated with drugs	MalChildDrug
6	incidence of tuberculosis	Tbpreval
6	prop of tuberculosis cases detected and cured under directly observed treatment	TBCaseTreat
7	Prop of Land area cover by forest	ForestArea
7	prop of total water resources used	WaterUse
7	prop of pop using improving dirnking water source	ImprovedWat
7	prop of pop using Improving sanitation facility	ImprovedSan
8	mobile cellular per 100	CellPhon/per
8	interent users per 100 inhabitatns	Internet/per

Matrix Supplement: How Rankings Were Determined

Abbrev	Quantitative Goal (Description)	% Change Since First Measur	Current Value if App	Progress Toward Goal (% of)	Relative Ranking:
PovGap\$1.25	Decrease 50%	-0.54		108	5
PovGapNat	Decrease 50%	-0.24		48	3
Top10%IncSh	Decrease 50%	-0.11		22	1
Unemploy	0%	-0.33	3.70%	96.3	5
MalnutUnd5	Decrease 50%	-0.13		26	2
PrimEnroll	100%	0.021	40.10%	40.1	3
PrimReten	100%	0.078	67.76%	67.76	4
MaleLit	100%	-0.016	60.77%	60.77	4
FemLit	100%	-0.435	27.03%	27.03	2
F/MPrimEnroll	50%	0.021	82%	164	6
F/MSecEnroll	50%	0.129	92.10%	184.2	6
F/MTertEnroll	50%	1.31	55.10%	110.2	5
AgrLabor%F	50%	-0.001	89.95%	179.9	6
ParliamentWo	50%	0.41	11%	22	1
USMortality	Decrease 66%	-0.643809524	-	96.96969697	5
InfantMort	Decrease 66%	-1.519642857	-	230.3030303	6
MeaslesImmu	Decrease 66%	0.379310345	-	56.06060606	3
MaternalMort	Reduce by 75%	-0.407692308	-	54.66666667	3
ContracepWor	100%	0.14	11.40%	11.4	1
UnmetNContr	0%	0	35.60%	64.4	4
HIVPrev	To Have 0 or Negative %	-0.590909091		159	6
AdvancHIVTre	100%	0.954545455	43%	43	3
InsectNetU5%	100%	0.40530303	37%	37	2
MalChildDrug	100%	-0.028911565	57.10%	57.1	3
Tbpreval	Negative % Change in Pr	0.282700422	-	71.7	4
TBCaseTreat	100%	0.162162162	86%	86	4
ForestArea	"Integrate"	-0.071134235	-	7.11	1
WaterUse	Improve	0		50	3
ImprovedWat	Increase 50%	0.159802306	-	31.96	2
ImprovedSan	Increase 50%	0.568965517	-	113.8	5
CellPhon/per	Improve Positive Percen	10.23306773	-	110.2	5
Internet/per	Improve Positive Percen	3.559386973	-	103.5	5



Dev-Info: Liberia Sub-National Database

Methodology	Description
"Bucketed Standard Normal Indicator"	The normalized Z-Score for each indicator was found by comparing the standard deviation of the indicator value for that year across regions compared to the national average value for that year for the indicator. The Z-scores were not sign adjusted.
"Conflict Quantity and Severity"	The Conflict Quantity was found by accessing the Liberia entry from the ACLED Database for reported conflicts. A pass ban filter was set at conflicts above zero deaths and summing the total conflicts in each region from 2000. The total severity of the conflicts was found by summing the total fatalities from those conflicts to find the total fatalities per conflict for each region since 2000. This data is included in the Bucketed Standard Normal Indicator.
Bucket Determination	Each indicator for each region was sorted into a "bucket" most indicative of the larger sector of Liberian society that variation in the indicator most contributes to. The indicators were sorted into buckets to elucidate relationships or correlations between indicators that contribute to the same larger sector or reveal subtle connections between indicators contributing to vastly different sectors.

Dev-Info: Liberia Sub-National Database Indicator Descriptions

Database covers 23 Geographical Areas 280 Variables or Indicators sorted by Region covering the Time period 1984-2011.	Bucket		
Contact of Database Administrator for further inquiry: Lewis M. Marwolo - Liberia Institute of Statistics and Geo-Information Services Email: Lewis.marwolo@lisgis.org	Agriculture:		
	Indicator Name	Description:	
	Tools for agriculture 2006	agricultural tools used per hectare of arable land	
	Seeds for agriculture 2006	seeds used per hectare of arable land	
	Percent of households that cultivate in 2005 2006	% of total households in region that cultivate crops from arable land in 2006	
	Economics		
	Per-capita total expenditure(LD) 2006	Average regional yearly expenditure per capita in Liberian Dollars 2006	
	Per-capita non-food expenditure(LD) 2006	Average regional yearly expenditure on non-food items per capita in Liberian Dollars 2006	
	Per-capita food expenditure(LD) 2006	Average regional yearly expenditure per capita on sustenance items only in Liberian Dollars 2006	
	Education		
	Female Gross enrolment ratio of population aged 6 - 18 years 2006	Fraction of total female regional population enrolled in primary school in 2006	
	Male Gross enrolment ratio of population aged 6 - 18 years 2006	Fraction of total male regional population enrolled in primary school in 2006	
	Total Gross enrolment ratio of population aged 6 - 18 years 2006	Fraction of total regional population enrolled in primary school in 2006	
	Food for education 2006	Percentage of total food resources (as described by average consumed materials) allocated for educational facilities	
	Educational support 2006	% of total regional government funds allocated toward educational support in 2006	
	Gender		
	Population - Sex ratio 2008	Ratio of Females to Males in Regional Population	
	Health		
	Vitamin A" supplementation coverage (in past 6 months)" 2006	Percentage of Population covered with Vitamin A supplements in region in 2006	
	Proportion of the population using improved sanitation facilities 2006	% of Households with Access to "improved"sanitation sources in 2006 as defined by the MDG	
	Proportion of household applying prevention strategy 2006	% of Households in region in 2006 using Malaria prevention strategies	
	Proportion of children that slept under mosquito net lastnight 2006	Average % of total cohort of children under five that sleep under a Malaria protection net on a given night in the region	
	Proportion of children de-worm 2006	% of children under 5 total regional cohort that have received de-worming treatment	
	Prevalence of wasting children(under five years of age) 2006	% of total children under five experiencing wasting	
	Prevalence of underweight children(under five years of age) 2006	% of total children under five that are underweight	

Dev-Info: Liberia Sub-National Database Indicator Descriptions

Prevalence of stunting children(under five years of age) 2006	% of total children under five experiencing growth stunting
Prevalence of fever 2006	% of total regional population experiencing fever on average per day
Prevalence of diarrhea 2006	% of total regional population experiencing diarrhea on average per day
Prevalence of cough(rapid, short) 2006	% of total regional population experiencing a short, rapid, cough on average per day
Diarrhea treated with no liquid 2006	% of Diarrhea cases in regional population treated without liquid sources
Infrastructure Watsan 2006	Qualit of Water and Sanitation Facilities: % of Population with Access to improved Water and Sanitation as defined by the Millenium Development Goals
Reconstruction 2006	Percentage of total road coverage under reconstruction
Acess to land 2006	Percentage of total population in region with access to natural land reserves
Access to safe drinking water in rainy season 2006	Percentage of total population with access to safe drinking water during the rainy season
Access to safe drinking water in Dry season 2006	Percentage of total population with access to safe drinking water during the dry season
Population Proportion of population that went away from home but not displaced nor refugee 2006	Percentage of population that ventured from home and returned to that location without displacement
Proportion of population that was never displaced 2006	Percentage of population polled in region that has never experienced displacement
Proportion of population that returned since 2005 2006	Percentage of population that ventured from home that returned within the year
Proportion of population displaced/refugee 2006	Percentage of population that ventured from home that was displaced or became refugees
Proportion of household experiencing shock 2006	Percentage of total households in region that are experiencing "shock" as defined by a disruptive event that disallows the normal day to day activites of the household or prevents survival or normal standard of living of its habitants
Population density 2008	Population Density of each region 2008
Population - Average household size 2008	Average Number of people living in each household in each region

Map Metadata (I)

- Market access:
 - From village data set
 - Health status, school, infrastructure access, 4 wheel drive car access in wet and dry – that was because we couldn't find high enough resolution data on a port or market access indicator –
- Labor characteristics – health of population (indicator summed from Dev-Info database) , education of population (indicators of subnational database)
- Stability – composite of population –displaced refugee population Z score and percent of households in shock – Z scores

Female Gross enrolment ratio of population aged 6 - 18	General level of education
Total Gross enrolment ratio of population aged 6 - 18 ye	
Educational support 2006	
Proportion of children de-worm 2006	
Prevalence of wasting children(under five years of age) 2	General health status
Prevalence of underweight (under 5 years) - weight-for-	
Prevalence of stunting children(under five years of age)	
Prevalence of fever 2006	
Prevalence of diarrhea 2006	General instability
Prevalence of cough(rapid, short) 2006	
Proportion of population displaced/refugee 2006	
Proportion of household experiencing shock 2006	

Map Metadata (II)

- Land value risk was crop land value X risk of change due to climate change projections (growing season projections from the GAZE sources and putting that overlain with what the most valuable from) – the crop value indicator was from GAZE –
- Cropland potential value: looking at projected changes in growing season over cropland seeing that these are areas where you are going to see increases in growing seasons and you have existing crops being grown – agricultural areas:
- Weighting –
 - For each map, there relevant index was classified into ranks, and reclassified from 1-5 in order to allow combination
 - A weighted overlay was done to get the final product

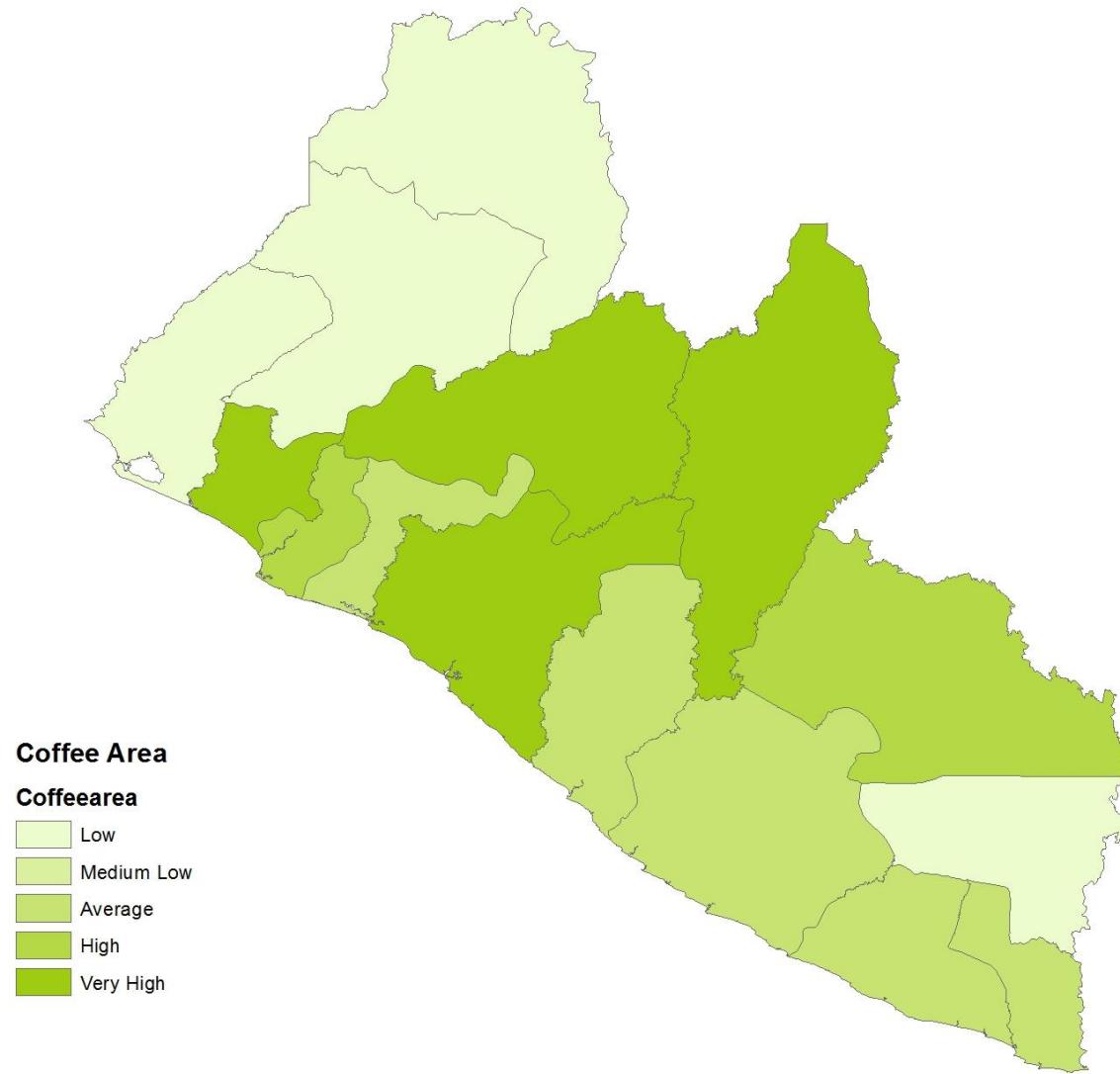
Map Metadata (III): Conflict

Source	Description
1. ACLED Conflict Database	The most recently updated full version of the dataset covering 1997 to 2012 inclusive for all African countries is available under the 'Africa' data tab below. Other regions and data categories are available under the listed tabs. Files for all countries are composed of ACLED events which indicate the day, actors, type of activity, location, fatalities, sources and notes for individual politically violent events. The most recent version of the dataset (Version 3) also contains systematically reviewed data and corrections for older events which have been cleaned to reflect strict standards.
Source: www.acleddata.com/data/africa	
	ACLED data are presented in two forms: the first is an excel sheet called "COUNTRY X" which contains records of all politically violent events which took place in the territory of this country (even if involving non-national actors). The second form is a shapefile for each country and the continent, usable in any spatial software package.
	The ACLED database qualifies a unit or event for analysis by the following: "a politically violent event is an altercation where often force is used by one or more groups for a political end, and although some instances-including protests and nonviolent activity - are included to capture the potential pre-cursors or critical junctures of a conflict. ACLED codes events as occurring at a specific date (day), location (town, latitude and longitude) and involving specific groups engaged in a defined action.
	ACLED records EVENTS between designated actors which occur. Event types include Battles: No change of territory Battles: Rebels Overtake Territory Battle: Gov. Regains Territory Non Violent Activity Non-Violent Transfer of Territory Headquarters of Base Establishment Riots Protests Violence Against Civilians

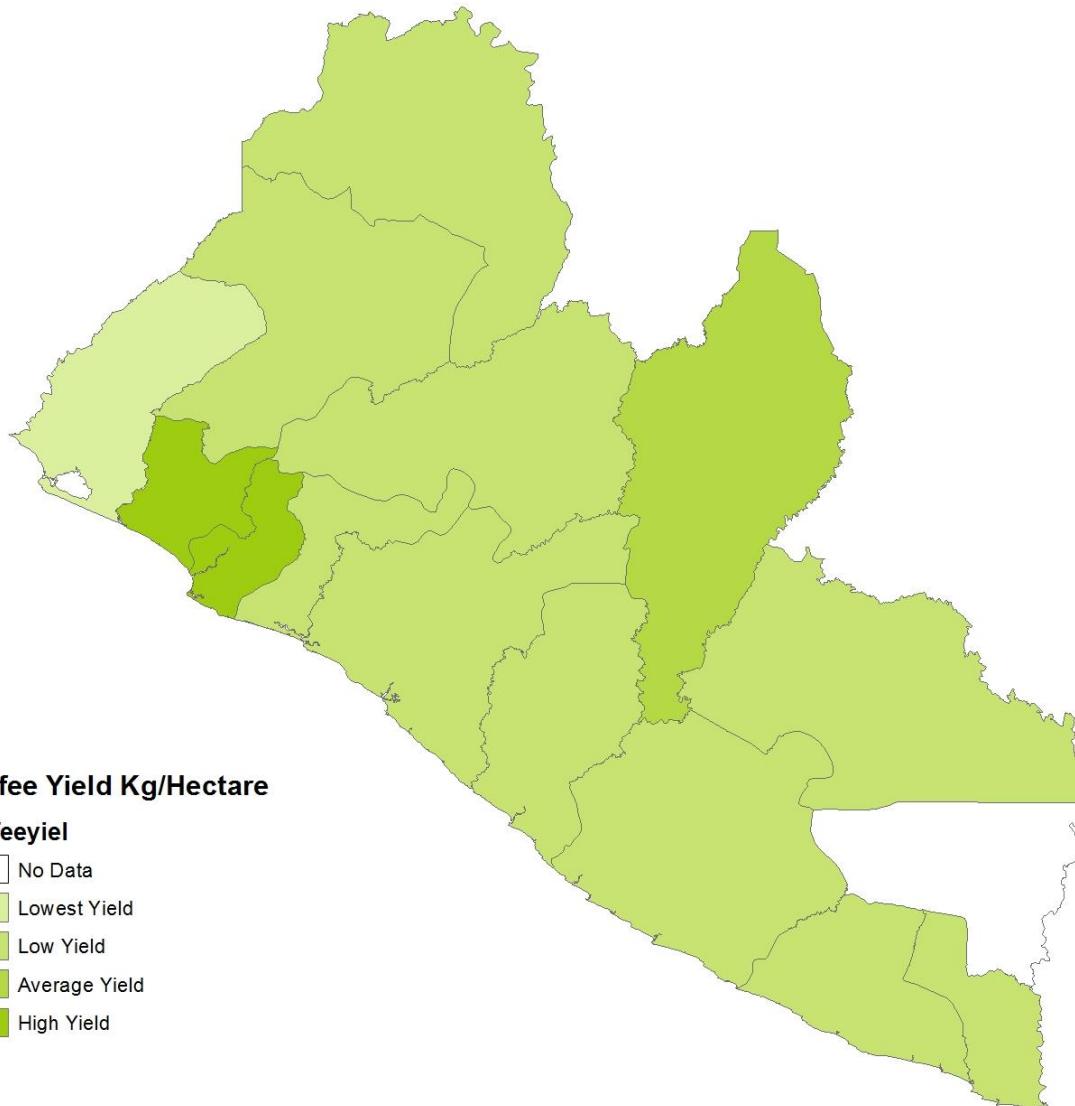
Map Metadata (III): Conflict contd

Fatalities:	ACLED records estimates of fatalities when reported from source materials. If event takes place over multiple days and only total fatalities are reported fatalities are divided evenly over the number of days (provided they are higher than 1).
ACLED Data Sources include:	daily, local, regional, national, and continental media, NGO, humanitarian agency, supp African focused news reports. Every event is based on at least one source, the name of which is noted in the database.
Overall Information:	This database contains the official UN statistics used in monitoring the world's progress towards the Millennium Development Goals. The database is published by the United Nations Statistics Division. Data is included as of 2011, or early 2012 for a few select indicators and countries only.

Geospatial Representation of Agricultural Area Devoted to Coffee in Liberia



Geospatial Representation of Liberian Coffee Yield



Coffee Market Information:

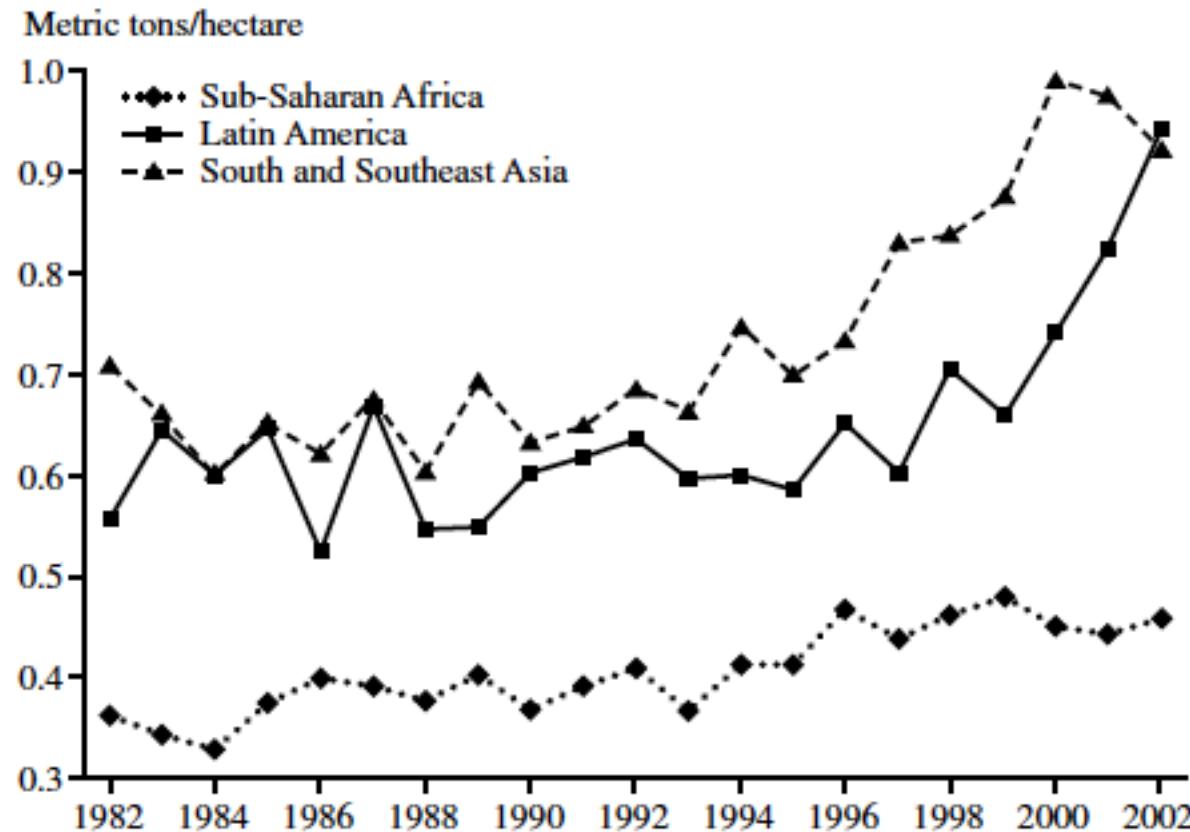
Table 2.3 Growth rate of cocoa production and exports (annual average %)

Region	1980–89	1990–2003	1980–2003
Sub-Saharan Africa			
Production growth rate	5.0	3.7	4.2
Export volume growth rate	4.7	3.3	4.0
Export value growth rate	0.4	5.0	1.2
Share of cocoa in Sub-Saharan Africa's agricultural trade value	19.2	15.5	17.2
World			
Production growth rate	4.4	2.1	3.4
Export volume growth rate	6.1	2.4	3.7
Export value at current prices growth rate	1.3	4.2	0.9
Share of cocoa in world agricultural trade value	1.1	0.6	0.6
Share of Sub-Saharan Africa in world cocoa market	64.9	64.0	61.1

Source: FAOSTAT (2006), last accessed in March 2006.

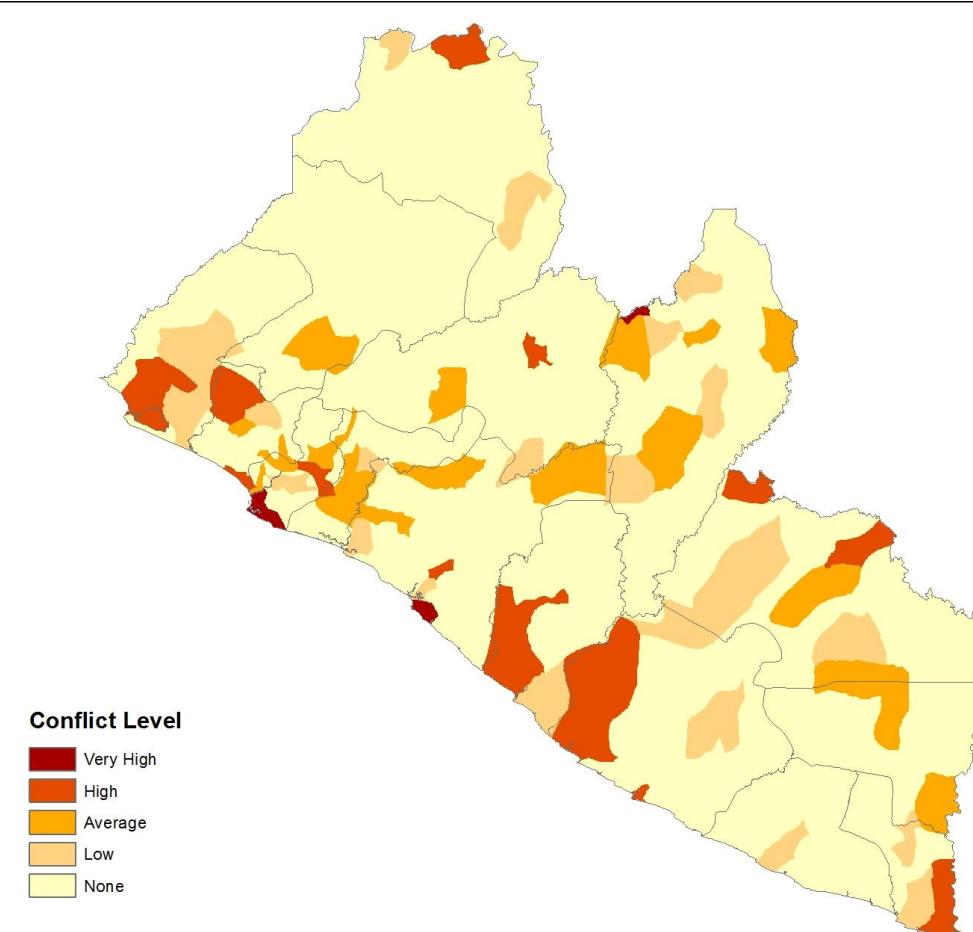
Coffee Market Export Information: Sub Saharan Africa

Figure 2.2 Coffee yield in Africa, Latin America, and Asia

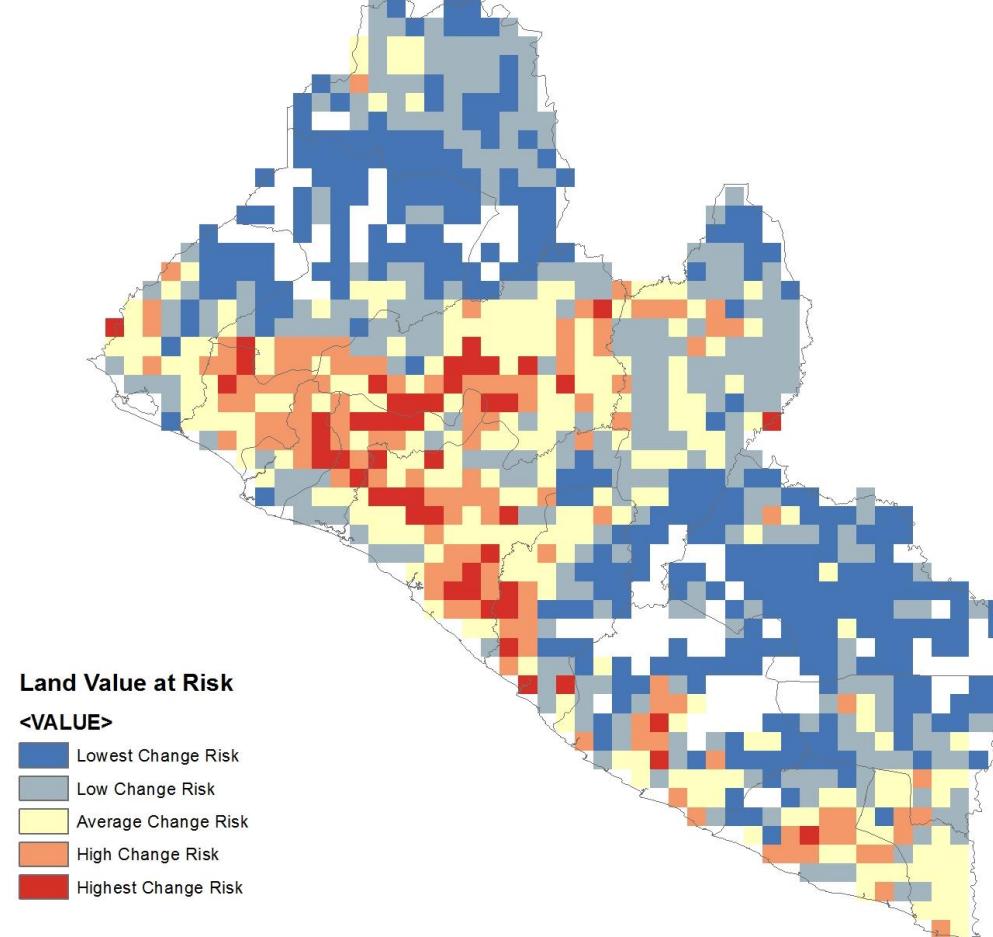


Source: FAOSTAT (2006).

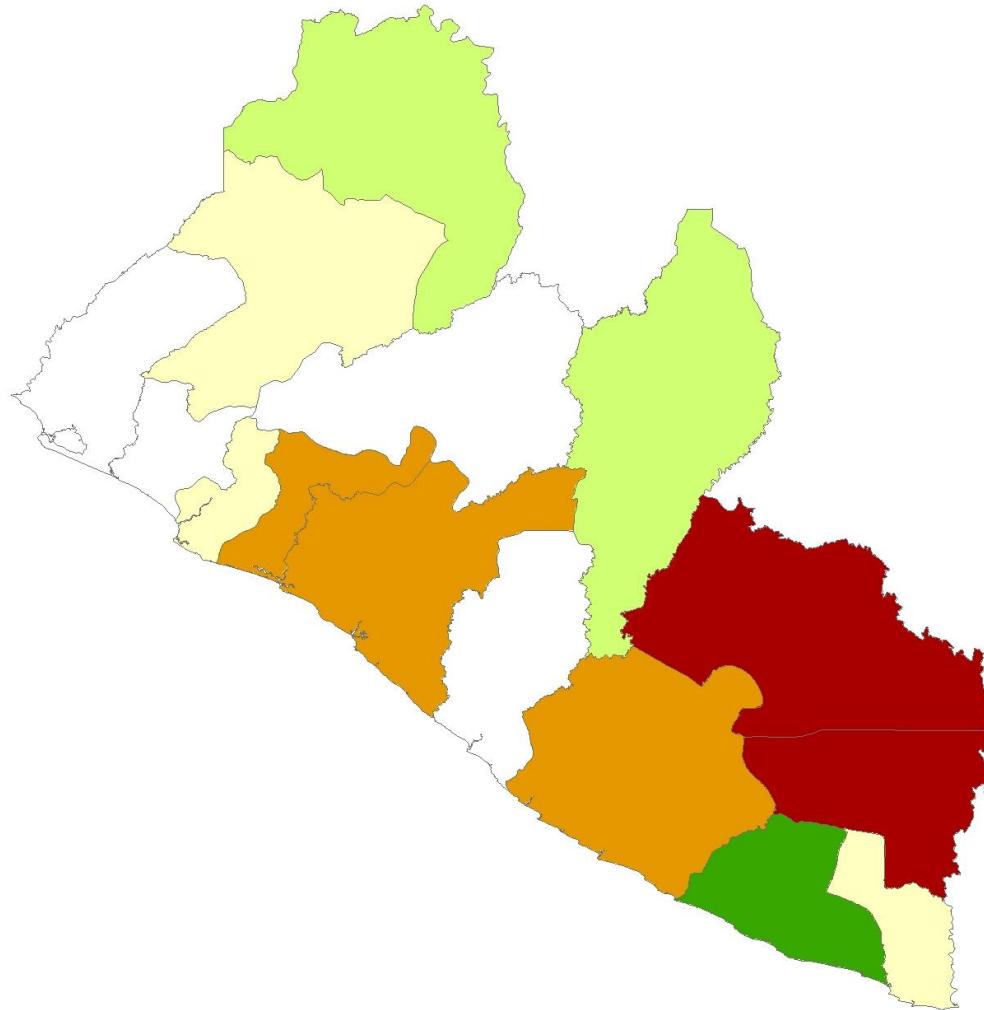
Risk Maps: Conflict



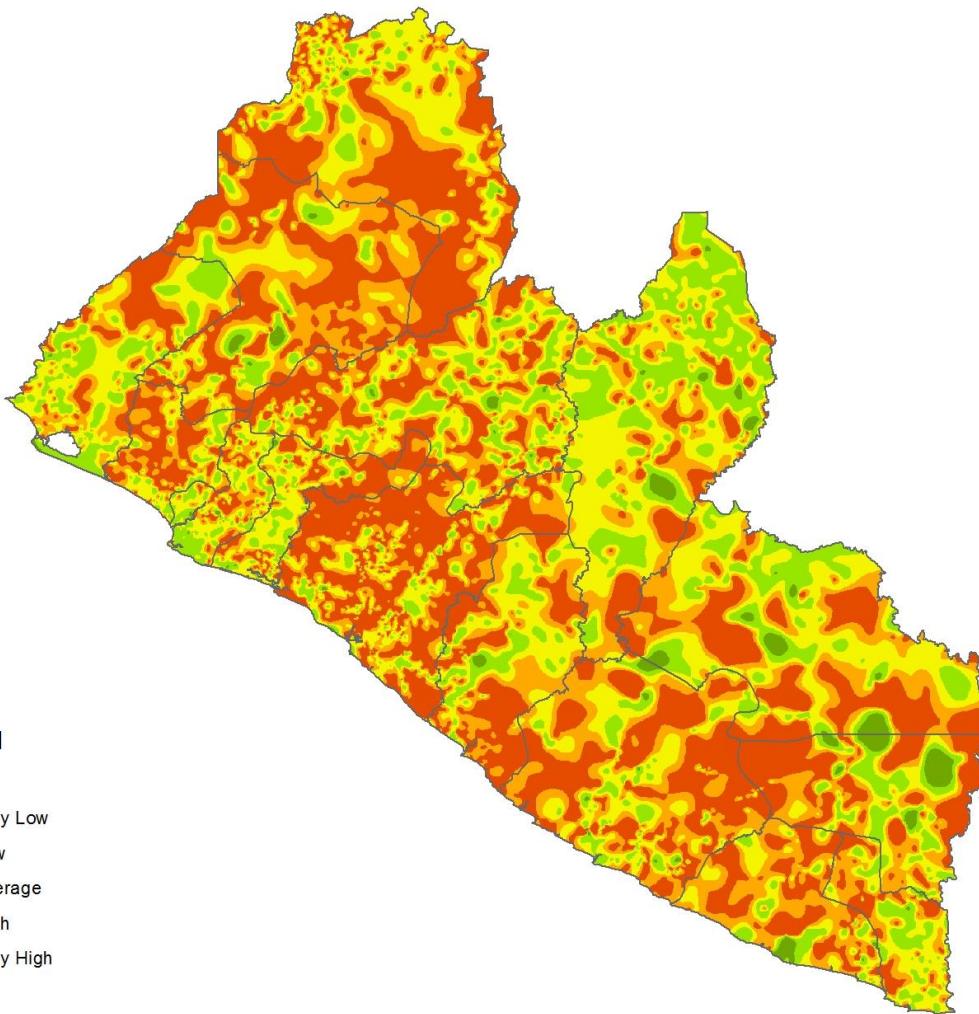
Risk Maps: Land Value Risk



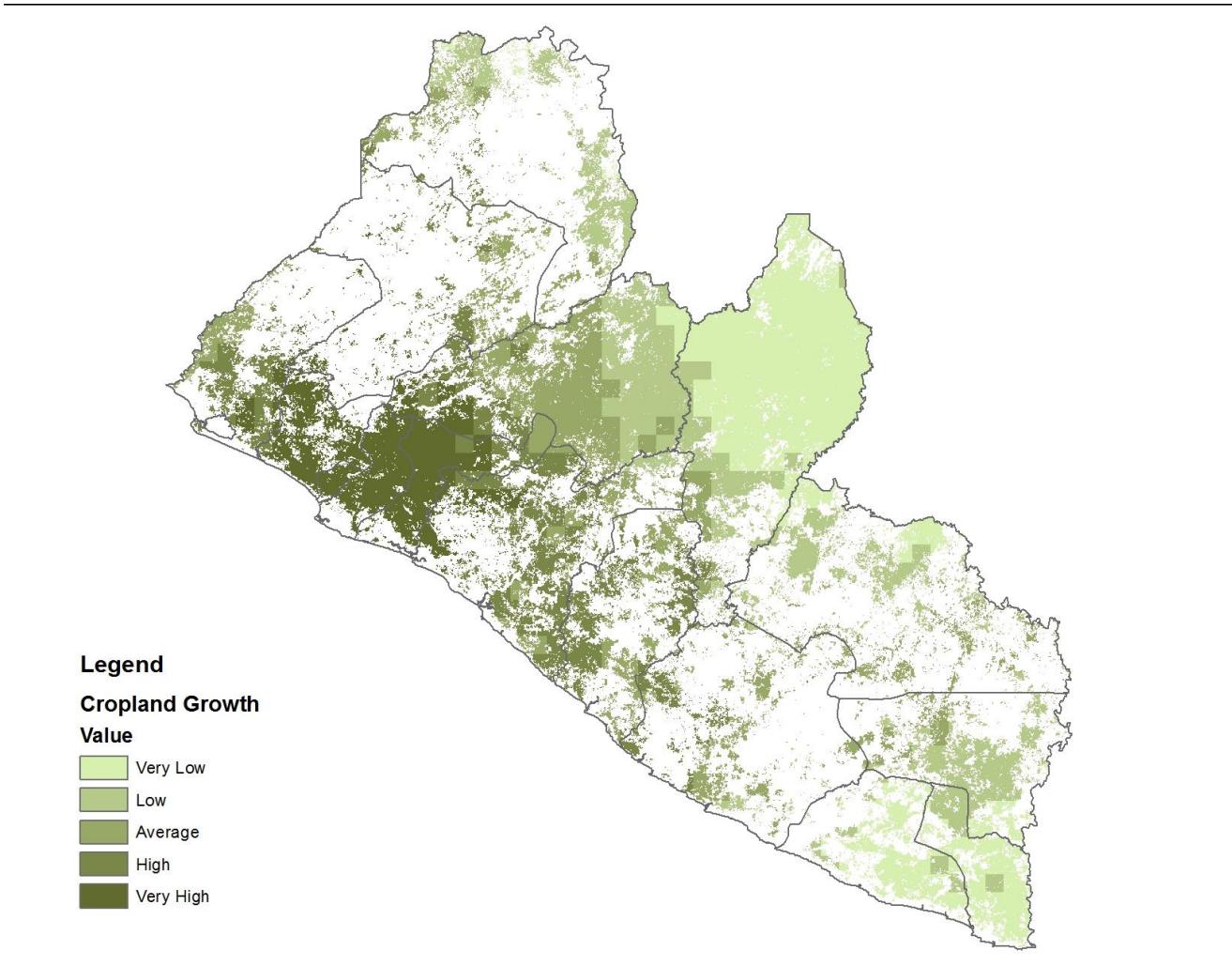
Risk Maps: Stability



Profit Maps: Market Access



Profit Maps: Crop Land Growth



Profit Maps: Labor Quality

