



## 2019 Sustainability Research Projects

In Holland, we believe that in order to become a vibrant, world-class community we must look at all aspects of our community. This includes the economic, social, and environmental impacts we all have.

Our City of Holland Sustainability Committee has created a seven-pillar framework with “lenses” to help us evaluate and make more sustainable choices. We have used this framework model as a way to identify the 2019 Hope College Sustainability Research Projects.

### Framework Categories

SMART ENERGY | ECONOMIC DEVELOPMENT | TRANSPORTATION | COMMUNITY & NEIGHBORHOOD  
QUALITY OF LIFE | COMMUNITY KNOWLEDGE | ENVIRONMENTAL ACTION & AWARENESS

The Holland-Hope College Sustainability Institute (HHCSI) would like to formally recognize the following projects. This year’s research projects will also be designated with a “green ribbon” on their research poster at the 2019 Celebration of Undergraduate Research and Creative Activity on April 12th.

For more information about the In Framework visit: [www.hollandsustainabilityreport.org](http://www.hollandsustainabilityreport.org)

**SMART ENERGY** | Our way of living requires a stream of energy to operate personal and infrastructure devices. We know that energy is produced with scarce resources and the byproducts impact our environment. We need to use both conservation and efficiency measures to manage the resources we have to provide access to reliable and cost effective energy.

20	Grace Kunkel, John Rogers. Other Students Involved in the Research: Andrew M. Ochs, Daniel P. Weller (MSU), Daniel L. Stevens	Dr. Mary Elizabeth Anderson, Chemistry	Solution-Phase Synthesis and Thermoelectric Characterization of n- and p-type Tetrahedrite Nanoparticles
25	Brittany Devlin	Dr. Jennifer Hampton, Physics	Comparing the Intercalation of Na, Mg, and Al in Prussian Blue Analogues
26	Kameron Wilcox	Dr. Jennifer Hampton, Physics	The Effect of Potassium Hexacyanoferrate (III) Concentration on Prussian Blue Analogue Charge Storage
27	Jacob Kelley	Dr. Jennifer Hampton, Physics	Study of Charge Transfer Quantities of Prussian Blue Analogues Using Electrochemical Impedance Spectroscopy
28	Scott Joffre	Dr. Jennifer Hampton, Physics	Comparing Electrochemical Analysis and Particle Induced X-Ray Emission Measurements of Prussian Blue Analogue Deposits
29	Forest Rulison	Dr. Jennifer Hampton, Physics	Ion beam Analysis for Silicon Carbide Crystals and Battery Materials



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**ECONOMIC DEVELOPMENT** | The business community is the driving engine within the area. While it is dependent on community resources and structure for support, it generates capital essential to growth and development.

7	Caleb Tallquist, Louis Kopp	Dr. Mike Jipping, Computer Science	Bilancio: An Easy Way to Manage Your Money
141	Quincey Glupker	Dr. Steven McMullen, Economics	The Impact of Immigration on Wages in the United States
142	Yizhe Zhang	Dr. Steven McMullen, Economics	The Impact of Income Differentials on the Decision to Migrate
143	Nicholas Schanhals	Dr. Steven McMullen, Economics	The Impact of Immigration on Wages: An Empirical Analysis Controlling for Skill-Level
144	Olivia McCalla	Dr. Steven McMullen, Economics	The Impact of Unemployment on Wage Rates
154	Mason Schut	Dr. Steven McMullen, Economics	Diversification of Wealth and Wealth Management across Socioeconomic Status
155	Christian Rhoades	Dr. Steven McMullen, Economics	The Effects of Minimum Wage Laws on SNAP Enrollment in the United States
156	Thomas Kouwe	Dr. Steven McMullen, Economics	The Effect of Maryland's Minimum Wage Hike on Employment: A Synthetic Control Analysis

**COMMUNITY & NEIGHBORHOOD** | The fiber of our lives can be traced to the places we live and the individuals we interact with on a daily basis. The places we live support the development of our personalities and perspectives on life. Communities at all scales have a vital role to play. Encouraging vital and effective communities is an important element.

65	John McMorris	Dr. Yew-Meng Koh, Mathematics	Using Factor Analysis in Variable Selection and Clustering of US Mass Shooting Incidents
66	Tyler Gast. Other Students Involved in the Research: John McMorris	Dr. Yew Meng Koh, Mathematics	Classifying and Predicting US Mass Shooting Incidents
112	Kinzly Dressler, Braden Griffin	Dr. Virginia Beard, Political Science	Swing Vote Influencers on Congressional Roll Call in 2018
113	Taylor White	Dr. Virginia Beard, Political Science	Does the Digital Divide Exist and How is it Affecting Africa?
114	Makena Mugambi	Dr. Virginia Beard, Political Science	Does the Digital Divide Exist and How is it Affecting Africa?
115	Claire Bates	Dr. Virginia Beard, Political Science	Is There a "Resource Curse" and What does Africa Reveal about Its Existence and Impact on Political and Economic Stability and Development?



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116	Luke Rufenacht	Dr. Virginia Beard, Political Science	The Resource Curse in Africa
117	DeVante Cosby	Dr. Virginia Beard, Political Science	Foreign Aid and African Political and Economic Development?
118	Sanny Yang	Dr. Virginia Beard, Political Science	Foreign Aid and African Political and Economic Development
119	Maddie Smith, Nazareth Frezghi	Dr. Virginia Beard, Global Politics	Global Politics: Political Culture B
120	Ester Fletcher	Dr. Lynn Japinga, Women and Gender Studies	The Alternative Black Girl in Popular Culture: An Examination
123	Kinzly Dressler	Dr. Rachel Schutte, Political Science	Trends in Roe Roll Call Voting
124	Elisabeth Beck	Dr. Rachel Schutte, Political Science	The Role of Minority Parties in Coalition Governments
125	Emily Marino	Dr. Rachel Schutte, Political Science	Geographical Coercion: Land Dividing the U.S. Along Partisan Lines
126	Katheryn Irwin	Dr. Rachel Schutte, Political Science	Rural Brain Drain
127	Abigail Finnegan	Dr. Rachel Schutte, Political Science	Women and Political Participation
128	Erick Núñez	Dr. Rachel Schutte, Political Science	Living in Fear: The Politics of Sanctuary Cities
129	Molly Douma, Maryah Phillips	Dr. Virginia Beard, Political Science	Public Opinion and Influences on Government Assistance
130	Isabel Hodson, Andrew Porter, Audrey Revercomb	Dr. Virginia Beard, Political Science	Political Opinion
131	Natalie Harten, Michelle Abraham	Dr. Virginia Beard, Political Science	Global Politics: Political Behavior A
132	Mike Boynton, Sophia Rachor	Dr. Virginia Beard, Political Science	Global Politics: Political Culture A
135	Yung Yue Tneh	Dr. Rachel Schutte, Political Science	Influences of Corruption on Political Participation
136	Madison Smith	Dr. Rachel Schutte, Political Science	Political Polarization and Voter Turnout



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137	PJ Johnson	Dr. Rachel Schutte, Political Science	Social Media Usage and Political Participation
138	Sarah Gargan	Dr. Steven McMullen, Economics	The Effect of a Changing Marriage Age on Marriage Continuity
139	Leah Overbeek	Dr. Steven McMullen, Economics	The Role of Gender in Job Satisfaction
183	Jenny Lussenhop	Dr. Deirdre Johnston, Communication	The Complex Role of the Church in South Africa in the Justification of Apartheid, Racial Reconciliation, and the Anti-Apartheid Struggle
184	Leah Asen	Dr. Marissa Doshi, Communication	Sheryl Sandberg: A look at Women in the C-Suite
186	Halla Maas	Dr. Jeanne Petit, History Department	Hope College and the Vietnam War
191	Itzayana Zuniga	Dr. Deidre Johnston, Communication	Trangenerational Trauma
195	Kamryn Ramsay	Dr. Japinga, Women's and Gender Studies	Legalized Abortion and Women's Health: The True Defender of Life
201	Hannah Barnes	Dr. Kendra Parker, English	Disability in Black Women's Speculative Fiction
202	Cadence Jones	Dr. Lynn Japinga, Religion	Hysteria: A Look at Sexism in Medicine

**QUALITY OF LIFE** | Ultimately, it is the feelings and state of mind of individuals in the collective that make up a community's quality of life. The community through governmental, religious, business and social organization, makes decisions and supports actions that contribute to the community's well being.

10	Alexandra Vroom, Emma Johnson, Anastasia Perecki, Lauren Czmer	Dr. Anita Esquerra-Zwiers, Nursing	Mother's Milk for Michigan Infants: Exploring the Personal, Social, and Biological Factors of Maternal Milk Supply
13	Rebecca Chema	Dr. Anita Esquerra-Zwiers, Nursing	Theory of Planned Behavior: Examining Breastfeeding Intentions and Behaviors
16	Sarah Stroup	Dr. Vicki Voskuil, Nursing	Exploring the Physical Activity Behavior and Needs of Adolescent Girls Using Activity Trackers: A Mixed-Methods Study
18	Gretta Nyboer	Dr. Barbara Vincensi, Nursing	The Effects of Self-Reported Spiritual Importance on Patient Satisfaction With Chaplaincy Services



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37	Michael Giurini	Dr. Kenneth Brown, Chemistry	Development of New Electrode Surfaces for Glucose Biosensors
43	Joel Karsten	Dr. Maria Burnatowska-Hledin, Biology/Chemistry	Use of the CRISPR/Cas9 Gene Knockout System to Study the Effects of VACM-1/CuI5 on Cellular Proliferation
44	Skylar Sundquist	Dr. Maria Burnatowska-Hledin, Biology and Chemistry	The Regulation of Cellular Proliferation by VACM-1/CUL5 is Dependent on its Posttranslational Modifications by NEDD8
45	Sarah Bonema	Dr. Maria Hledin, Biology, Chemistry	Effects of VACM-1/CuI5 Gene Knockout in T47D Breast Cancer Cells Using CRISPR-Cas9
51	Lauren Evert, Gonzalo Moya	Dr. Andrew Gall, Psychology and Neuroscience	Mixed Mood State Behaviors and Circadian Dysfunction following Homocysteic Acid Treatment: Potential Animal Model for Bipolar Disorder
52	Rebecca Messnick, Lauren Evert, Cameron Everse, Micah Manthei, Abby Rakus	Dr. Andrew Gall, Psychology and Neuroscience	Biopsychosocial Correlates of Sleep Hygiene in Preschoolers
53	Lauren Evert, Cameron Everse, Rebecca Messnick, Micah Manthei, Abby Rakus	Dr. Sonja Trent-Brown, Psychology	The Impact of Parent Awareness on Preschoolers' Sleep
67	Noah Weigle. Other Students Involved in the Research: Clare Da Silva, Leslie Perez	Dr. Gerald Griffin, Psychology and Biology	Impact of HSV-1 on an in vitro Model of Traumatic Brain Injury
70	Nicholai Shaw, Lilly Hemesath, Nina Cuthrell	Dr. Alyssa Cheadle, Psychology	The Association between the Postpartum Period and Depressive Symptoms
71	Anna Langholz. Other Students Involved in the Research: Allie Thiel, Trevor Sooy	Dr. Alyssa Cheadle, Psychology	Associations Between Social Support and Positive Psychosocial Variables in Pregnant Women
72	Lauren Thorne, Allison Darnell, Yuankun Gu	Dr. Alyssa Cheadle, Psychology	Resilience and Health in College Students
85	Michael Dennis, Barry Bait	Dr. Katharine Polasek, Engineering	EEG Analysis of Physically and Electrically Activated Sensation



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86	Joseph Krockner	Dr. Katharine Polasek, Engineering	A Model of Selective Activation Using Surface Electrical Stimulation
101	Kayla Russell, Noah Weigle	Dr. Gerald Griffin, Biology	Testing the Impact of Neuronal Damage on HSV-1 Latency
110	Karissa Libson	Dr. Steven Hoogerwerf, Religion	Caring for Difficult Patients: A Workshop Identifying Challenges and Opportunities
121	Amy Beasley	Dr. Katelyn Poelker, Psychology	Evidence for Equality?: Guatemalan Adolescents' Views on Gender
122	Jana Sahyouni, Sydney Hudock	Dr. Katelyn Poelker, Psychology	Who I Am: A Mixed-Methods Analysis of Guatemalan Adolescents' Identity Development
133	Hannah Bugg. Other Students Involved in the Research: Victoria Gardner, Lucy Cousens	Dr. Lindsey Root Luna, Psychology	Self-Regulation Predicts Virtue and Flourishing, above and beyond Self-Control
134	Ashley Hayden, Katrina Clayton, William Lake, Isabelle Matthews, Jonah Oman, Emily Peterson, Matthew Schuiling, Amanda Schultz. Other Students Involved in the Research: Hannah Bugg, Lucy Cousens, Victoria Gardner.	Dr. Charlotte vanOyen-Witvliet, Psychology	The Psychophysiology of Accountability
145	Victoria Gardner, Samantha Stall, Michala Ringquist, Caitlyn Heidenga, Isabel Cunningham	Dr. Alyssa Cheadle, Psychology	The Relationship between Resilience and Acute Stress
146	Michala Ringquist, Caitlyn Heidenga, Bailey Butler, Sarah Altieri	Dr. Meagher, Psychology	Sit Down. Be Humble: Assessing Intellectually Humble Behaviors in Groups and Individuals
147	Reece Lindemann, Kimberly Paquette	Dr. Alyssa Cheadle, Psychology	Work Stress and Pregnancy
151	Sarah Mozdren	Dr. Steven McMullen, Economics	The Effects of Health Insurance on Alcohol Consumption: Analyzing the Existence of Moral Hazard



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153	Kellen Gove	Dr. Steven McMullen, Economics	Exploring the Impact of Long Work Hours on Physical Health Outcomes
157	Abigail Meder, Elizabeth Woodford, Darby Baird, Nathalia Santos	Dr. Sonja Trent-Brown, Psychology	Acoustic Parameters of Child Speech
158	Darby Baird, Abby Meder, Elizabeth Woodford, Nathalia Santos	Dr. Sonja Trent-Brown, Psychology	Child Speaker Identification: Accuracy, Reaction Time, and Engagement with Children
160	Austin Hemenway, Sophie Kleinheksel	Dr. Brian Rider, Kinesiology	Examining Changes in Sleep Habits, Physiological Variables, and Physical Activity Behaviors in Division III Female Soccer Players during a Competitive Season
169	Katherine Veldink. Other Students Involved in the Research: Madelyn Mikitka	Dr. Dennis Feaster, Sociology and Social Work	Less Confusion, More Inclusion: Hope College Attitudes toward the RFLA Program
170	Hannah Kenny. Other Students Involved in the Research: Kate Veldink	Dr. Dennis Feaster, Sociology and Social Work	Hope College and Ready for Life: Kate's Story
171	Jacob Wantoch	Dr. Aaron Franzen, Sociology	Medical Students and the Kind of Doctors They Are Becoming
185	Keyshara Hudson, Amelia Waalkes, David Wang, Abigail Venlet	Dr. Marsely Kehoe, Director, Mellon Scholars Program in the Arts and Humanities	The Importance of the Virgin Mary as an Icon and the Evolution of Her Representation



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**COMMUNITY KNOWLEDGE** | The collective knowledge of the community is an incredible resource. The ability to tap into this wisdom is essential for continued growth. In both formal and informal channels, the community’s knowledge and energy must be channeled to where it is needed.

84	Julia Hardy, Erica Slenk. Other Students Involved in the Research: Jenny Pedersen	Professor Susan Ipri Brown, Engineering	Engineering the Future Academy
107	Elisabeth Cole	Dr. Jane Finn, Special Education	CASA Enrichment Program 2018
108	Reganne Diener, Jessica McAlpine. Other Students Involved in the Research: Nicole Radgens	Dr. Jane Finn, Special Education	Communication Participation: Let’s Have a Party!
140	Gordon VanWieren III	Dr. Steven McMullen, Economics	Neighborhood Effects on the Educational Attainment of First-Generation Immigrants
148	Reece Lindemann, Caleb Hoekstra	Dr. Marcus fila, Business	Delineating Higher Education Faculty Stress: Examining the Role of Resources on Stressor-Strain Relationships from Teaching, Research, and Service
149	Andy Atkinson	Dr. Steven McMullen, Economics	The Effects of Educational Attainment on U.S. Welfare Duration
150	Heather Bonga	Dr. Steven McMullen	Returns to Education: An Investigation into the Role of Gender in Post-Graduation Salary
192	Ernesta Cole	Yolanda Vega, Phelps Scholars	Phelps Scholar Alumni Project
200	Mikayla Battistone	Dr. Sarah Southard, Music	The Importance of Music Programs for At-Risk Youth within Urban Schools





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**ENVIRONMENTAL ACTION & AWARENESS** | The natural and built environments interact with one another over time with intended and unintended consequences. Educating the public on environmental protection and integrating these ideas into our city planning can change negative outcomes of the past and improve our future state.

60	Eleda Plouch	Dr. Elizabeth Sanford and Dr. K. Greg Murray, Chemistry and Biology	Isolation and Identification of Fungistatic Compounds from the Seeds of Pioneer Species
73	Elizabeth Morehead, Cleveland Tarp. Other Students Involved in the Research: Max Huffman	Dr. Hansen, Geology, Geological & Environmental Sciences	The Role of Water-Fluxed and Water-Undersaturated Melting in Garnetiferous Amphibolites across a Metamorphic Transect in the Eastern Segment of the Sveconorwegian Orogen, SW Sweden
74	Jonas Peterson, Jacob VanderRoest, Daniel Wade, Randal Wade, Sarah Brokus. Other Students Involved in the Research:	Dr. Jonathan Peterson, Geological & Environmental Sciences	A New Approach for Determining Size Distributions of Very Fine Particles in Aqueous Suspensions
75	Alexandra Donaldson	Professor Suzanne DeVries-Zimmerman, Geological & Environmental Sciences	Using Remote Sensing to Evaluate Historic and Current Hydroecological Changes in a Great Lakes Interdunal Wetland/Slack
76	Jacob Stid. Other Students Involved in the Research: Max Huffman, Ian Gorgenson	Dr. Edward Hansen, Geological and Environmental Sciences	Using Drone Acquired, High-Resolution, Multispectral Imaging to Predict and Monitor Coastal Dune Mobility: An Example from the Southeastern Shore of Lake Michigan
77	Samuel Heilman, Sally Hakim, Emily Hamilton, Marissa Lockwood	Dr. Kathy Winnett-Murray, Biology	Wildlife Activity Patterns at a Constructed Wetland Based On Trail Cam Monitoring
78	Katelyn DeWitt	Dr. Kathy Winnett-Murray, Biology	Environmental Value of Trees in the City of Holland
79	Analise Sala, Micaela Wells	Dr. K. Greg Murray, Biology	Assessing Hemlock Woolly Adelgid Impact on West Michigan Dune Forests
80	Ryan Woodside	Dr. K. Greg Murray, Biology	The Murray Wolf Project
87	Camille Fogg	Dr. Courtney Peckens, Engineering	Bio-Inspired Iterative Learning Techniques for More Effective Control of Civil Infrastructure
88	Rachel Foy	Dr. Courtney Peckens, Engineering	Bio-Inspired Control of Civil Infrastructure



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89	Cedric Porter, Taylor Rink	Dr. Courtney Peckens, Engineering	Wireless Sensor Networks for Long-Term Monitoring of Urban Noise
91	Amy Olgers, Chelsea Moore	Dr. Brian Bodenbender, Geological and Environmental Sciences	A Reconnaissance of Microplastic Distribution in the Lake Macatawa Watershed
92	Erin Kahn, Liam Kleinheksel. Other Students Involved in the Research: Brandon Bonilla, Carolyn Cooper, Eric Schumann, Chris Belica	Dr. Aaron Best, Biology	Monitoring of Chemical and Physical Water Quality Parameters in the Macatawa Watershed
93	Benjamin Fry, Jonas Peterson, Jacob Stid, Randal Wade, Sarah Brokus	Dr. Jonathan Peterson, Geological & Environmental Sciences	A Reconnaissance Survey of Metals in Untreated Drinking Water around the World
94	Daniel Wade, Jacob VanderRoest, Cleveland Tarp, Jacob Stid, Jonas Peterson, Josiah Peterson, Randal Wade, Sarah Brokus	Dr. Jonathan Peterson, Geological & Environmental Sciences	A Global Reconnaissance Survey of Untreated Drinking Water Sources: Potential Relationships to Worldwide Metadata
95	Jade Laughlin, Tena Baar. Other Students Involved in the Research: Daniel Settecerri, Meghana Sunder, Taylor Lombard, Lauren Eekhoff	Dr. Best, Biology	Dominican Republic Water Quality Study Using Point-of-Use Water Filters
96	Jacob Peecher, Shannon Smith. Other Students Involved in the Research: Megan Oostindie, Ford Fishman	Dr. Aaron Best, Biology	Utilizing qPCR Methods to Investigate <i>Escherichia coli</i> Replication in Freshwater Environments



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97	Eric Schumann, Abby Pearch, Richard Pellizzari. Other Students Involved in the Research: Chris Belica, Brandon Bonilla, Carolyn Cooper, Erin Kahn, Liam Kleinheksel, John McMorris, Jacob Peecher, Shannon Smith	Dr. Aaron Best, Biology	Environmental Factors Affecting Bacterial Community Composition in the Hypereutrophic Macatawa Watershed
98	Chris Belica, Brandon Bonilla, Ford Fishman. Other Students Involved in the Research: John McMorris, Abby Pearch, Jacob Peecher, Richard Pellizzari, Eric Schumann, Shannon Smith	Dr. Aaron Best, Biology	Genomic and Physiological Characteristics of Novel Escherichia Strains Isolated from Freshwater Sources
105	Abby Couwenhoven, Montserrat Dorantes. Other Students Involved in the Research: Shelby Bowers	Dr. Stephen Scogin, Biology and Education	How Pre-Service and In-Service Teachers' Philosophies Affect Their Perceived Value of STREAM School
106	Reese Yount	Dr. Stephen Scogin, Biology and Education	The Value of Outdoor-Based Programs on Students' Growth: Does PBL-Based Learning Actively Enhance Students' Soft Skills?
152	Grant Taylor Miller	Dr. Steven McMullen	The Effect of Air Quality on Labor Market Participation



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*We believe the Christian faith calls us to care for all of God's creation and ensure preservation for generations to come. We realize it is through our daily actions that we can make a big impact and create a better world for every individual, as one created and loved by God.*

*Called to be global citizens, we will engage the world constructively through our teaching, research, and community service in order to shape Hope College into a model of sustainability and be a force for good in the world.*

*Thank you to all of the students and faculty for their hard work this year!*

***Congratulations!***

**[www.hope.edu/sustainability-institute](http://www.hope.edu/sustainability-institute)**