

UBC Social, Ecological Economic Development Studies (SEEDS) Student Reports

**AN INVESTIGATION INTO SUSTAINABLE PAINTS**

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APSC 261  
TECHNOLOGY AND SOCIETY  
TERM PROJECT

## **AN INVESTIGATION INTO SUSTAINABLE PAINTS**

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## ABSTRACT

The design team for the new Student Union Building (SUB) at the University of British Columbia (UBC) is in need of more sustainable paint options for renovating the existing SUB, and for use in the new SUB currently in its early design stages. The scope of this report will cover brief triple bottom line assessments (TBLA) on three possible candidates for sustainable paints. The purpose of a TBLA is to research beyond just the economic factors of a product, but also analyze environmental and social factors throughout the entire lifecycle of a product. The lifecycle of paint begins from the extraction of raw materials, to processing and manufacturing, production, application, degradation, and finally disposal.

The three promising candidates are:

- AURO Pflanzenchemie AG
- YOLO Colorhouse
- Homestead House Paint Company, Inc.

AURO is headquartered in Germany, YOLO in Portland, Oregon, and Homestead in Toronto, Ontario. Each company offers a selection of sustainable paints, each with their advantages and disadvantages. Selection criteria created fall under each of the three main categories: Environmental, Social, and Economic. A decision matrix was then used to determine the best candidate for use in the existing and new SUB.

Ultimately YOLO proved to be the best candidate and it is recommended they be used for the new and existing SUB. YOLO was shown to take sustainability incentives socially and environmentally. The paint is competitively priced and is trans-geographically close to the target location.

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## **LIST OF ABBREVIATIONS**

CAD	–	Canadian Unit Currency
CNG	–	Climate Neutral Group
CO <sub>2</sub>	–	Carbon Dioxide
EPA	–	Environmental Protection Agency
GET	–	Green Enterprise Toronto
LEED	–	Leadership in Energy and Environmental Design
ILO	–	International Labour Organization
MSDS	–	Material Safety Datasheet
OSHA	–	Occupational Safety and Health Association
PCR	–	Post-Consumer Recycled
SUB	–	Student Union Building
TBLA	–	Triple Bottom Line Assessment
TSCA	–	Toxic Substances Control Act
UBC	–	University of British Columbia
VOC	–	Volatile Organic Compound

## 1.0 INTRODUCTION

This team has been tasked with evaluating options for a sustainable paint to be used in the new SUB building and in the renovation of the existing SUB building. Three different paint products have been set to be evaluated on a triple bottom line criterion as outlined in the methodology section. The three paints to be evaluated are natural paints by AURO Pflanzenchemie AG, milk paint by Homestead House Paint and acrylic paint by YOLO Colorhouse. Some governing bodies that can provide guidance in this project are the Green Seal Standards & Certification, the EPA (Environmental Protection Agency) and LEED (Leadership in Energy and Environmental Design). However, these agencies mostly provide a standard solely for the environmental criteria. This report will give a brief TBLA for each company's sustainable paint product offerings and then summarize the results in a decision matrix. The decision matrix will allow the team to compare and contrast paints with each other and then provide recommendations based on the results.

## 2.0 METHODOLOGY

The evaluation criteria are based on the chemicals, energy, and health affects throughout the lifecycle of the products. The renewability and company values are also taken into account. The products are evaluated as follows:

### Environment:

- Sustainability Initiative
- Renewability of Raw Resources
- Transportation of Product from Manufacturing to Distribution
- Trans-geographical distance from Distribution to the end user
- Recycleability of product
- Toxicity of Compounds in Product
- Harmful compounds in product
- Toxicity of Energy Used for Production
- Toxicity of energy used in Distribution
- Off-gassing of Harmful Compounds
- Off-gassing of Toxic Compounds
- Leeching of Harmful Compounds Once Disposed
- Leeching of Toxic Compounds Once Disposed
- Manufacturing Uses a Mixed/Green Energy Grid
- Distribution Uses a Mixed Energy Sources
- Renewability of Energy of Production
- Renewability of Energy of Distribution

### Social:

- Extraction Work Conditions
- Manufacturing Work Conditions
- Sustainability Initiatives
- Off-gasses to the end user
- Trans-geographical Distance to the End User

### Economic:

- Product Life Span
- Trans-Geographical Distance
- Nominal Cost
- Nominal Cost of Delivery

Environment and social are each weighed at 35% and economic at 30%. It was deemed that the social and environmental factors are more important and thus assigned a larger weighting than economic factors. Each paint is scored from zero to three (zero being the worst, and three the best) for each individual criteria. The total score of each paint for a given category is then tabulated. These values are normalized by dividing each total score by the maximum attainable score. This number is then multiplied by the weighting assigned to its respective category. The resulting scores for each category is



summed to provide the total final score. This grading system facilitates a systematic approach upon which to rank each point.

### 3.0 PAINT OPTION 1: AURO Natural Paints

AURO Pflanzenchemie AG was established in 1983 as a private company, and then went public in 1998.<sup>1</sup> AURO offers a wide selection of natural paint products that are 100% solvent-free. Headquartered in Germany, they distribute their paint products through roughly 700 ecologically specialized shops and craftsman's establishments worldwide.<sup>2</sup> Currently, they do not have a North American distributor. However, their paint products can still be purchased from many of their European outlets and shipped overseas. This section of the report will cover a brief TBLA performed on AURO. Specifically, it will cover the various environmental, social, and economic factors associated with AURO's paint products.

#### 3.1 Environmental Factors:

AURO has two main production plants; one is located in Braunschweig, Germany and the other in Kleinglödnitz, Austria.<sup>3</sup> Having production plants located solely in Germany and Austria means the final products need to travel quite a distance, either by land or air, to reach each of their establishments located outside of Germany or Austria. However, in 2007, AURO was the first and only manufacturer of natural paints to be certified by the Climate Neutral Group (CNG) as a carbon neutral company.<sup>4</sup>

For a natural paint to be truly all natural, petro chemistry should not be used to supply the raw materials. AURO focuses on plant sources for a steady supply of renewable raw materials.<sup>5</sup> In their product catalogue, they fully disclose every ingredient used in the production of a specific paint product. Also, an "AURO Raw Materials Guide" is provided by AURO giving information such as where a specific raw ingredient is obtained from, and/or how it can be used in their paint products.<sup>6</sup>

AURO uses the principle of "Gentle Chemistry" for the manufacture of their natural paints.<sup>7</sup> Through gentle chemistry, the brunt of the production process occurs in nature, since the raw materials are harvested directly from plants that have already naturally produced the precious raw materials. Paints from such manufacturing processes form a perfectly closed material cycle without a permanent effect on the environment.<sup>8</sup>

AURO primarily obtains its raw materials from Germany. However, a number of raw materials are also harvested from other parts of Europe, South America, Asia, and North America. The energy requirements and damaging greenhouse gas emissions (mainly Carbon Dioxide) are quite significant for shipping materials overseas, and typically have a significant impact on the environment. However, as mentioned before, AURO has been certified by CNG as a carbon neutral company, and has been able to offset its CO<sub>2</sub> emissions stemming from the production of their products.<sup>9</sup> This means AURO is able to compensate for their CO<sub>2</sub> emissions in the transportation of their raw materials, thus virtually eliminating environmental impact from harmful emissions.

Since AURO does not have a North American distributor at the moment, their paint products would have to be purchased from one of their European establishments and then shipped overseas to Canada. AURO UK would be the most likely candidate for purchasing paint products given they are the closest establishment to Canada. However, due to the need to ship purchased products overseas to Canada, this creates excess CO<sub>2</sub> emissions that can be avoided. Paint products purchased in Canada or even locally would generate substantially less CO<sub>2</sub> emissions during the transportation of the finished product.

One of the main benefits of natural paints offered by AURO is that they can be composted at the end of their lifecycle. Conventional paints typically need to be disposed of as hazardous waste since they contain numerous synthetic ingredients. However, there is no need for hazardous waste with AURO's natural paints. With this idea in mind, the following figure taken from AURO's website provides a good view of the raw materials lifecycle of a typical natural paint:

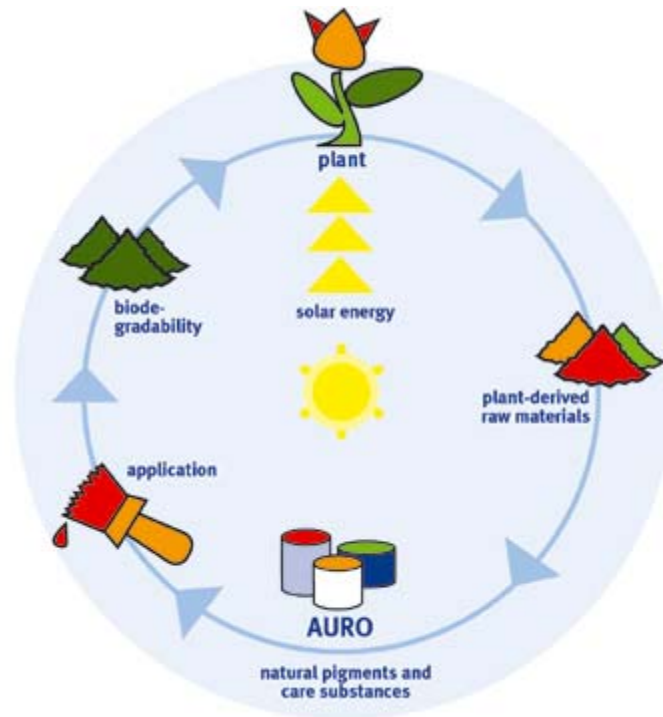


Figure 1 - Raw Materials Lifecycle of a Natural Paint<sup>10</sup>

Essentially, the raw materials used to produce natural paints comes full circle and is safely absorbed back into the environment with virtually no adverse impacts.

Since most of the raw materials making up natural paints are harvested from plants, the majority of the energy requirements have already been accounted through photosynthesis from the sun. This energy is naturally occurring and free.

Another important aspect to consider is the VOC concentrations in the paint products. VOCs are hazardous to the environment, and are found in most if not all paint products. However, AURO's natural paint products do not contain any petroleum substances. Thus, they emit little, if any, of the VOCs regulated by the strictest of standards.<sup>11</sup>

### 3.2 Social Factors

As mentioned before, AURO harvests raw materials from all over the world, both from developed and developing countries. Each country has its own social and labour practices, however not all are necessarily equally ethical and/or morally upstanding. Little information can be found regarding the harvesting practices AURO uses in developing countries like Brazil.<sup>12</sup> However, they most likely follow whichever standards the local community and/or country

regulates. It is safe to assume that in more developed countries like Germany and Austria, with stricter labour practices, that AURO follows ethical and moral standards. Similarly, AURO's production plants located in Germany and Austria must adhere to their respective country's labour laws and standards. However, at this time there is no indication that AURO surpasses the minimum required by law.

A common problem with paints is odour. A person's sensitivity to odour varies from person to person, however they can make for uncomfortable environments. Luckily, AURO offers their Aqua line of paints which are relatively odour free and are 100% solvent-free.<sup>13</sup> In other product lines, their paints are made from natural ingredients such as citrus oil and linseed oil, and the fragrance emitted by these paints may be of beneficial use.<sup>14</sup>

AURO does not claim to have allergy-free products due to the increasingly number of illness caused by allergies. It is difficult to claim an allergy-free product since there may be virtually no substance to which a person may or may not be allergic to.<sup>15</sup> However, to counteract this, AURO declares all ingredients used in their paint products. This way, a person may read all the ingredients and determine for themselves if it will cause allergies. Generally, natural paints are one of the healthiest paint products one can use. AURO's Airfresh line actually breaks down pollutants in the air using its photocatalytic (uses solar energy as a catalyst) properties.<sup>16</sup>

### **3.3 Economic Factors**

AURO claims their paints are "state-of-the-art"; with regards to their application and durability they are as good as most synthetic conventional paints.<sup>17</sup> As an example, AURO Aqua Woodstain No. 160 was nominated test winner by the German "Stiftung Warentest" which is an organization for the "Comparative Testing of Consumer Goods".<sup>18</sup> Essentially, the organization certified AURO's paint product as having a higher quality standard than known conventional paint manufacturers. Also, AURO's Aqua products typically have a storage time of 12 months. Even though natural paints may be considered the safest and most environment friendly paints, they possess a few disadvantages from an economical standpoint. They generally can take longer to dry than conventional paints, and are not always compatible with existing latex paint surfaces.<sup>19</sup> Also, AURO can only offer colour shades that can be mixed with mineral or vegetable pigments.<sup>20</sup>

When looking at the cost of the paint product not only is it important to look at the price per quantity, but also how much coverage one may achieve with each quantity. For example, AURO's Airfresh No. 328 paint costs £74.35 (GBP) per 10 litres. However, with those 10 litres one can achieve roughly 100 square meters of coverage. Therefore, this specific paint product costs only £0.7435 (CAD\$ 1.31) per square meter. Looking at cost per square meter is a better way to compare the costs of different paint products.

However, as mentioned previously, any paint products purchased from AURO would need to be shipped from Europe. Thus the shipping costs will be quite a bit more than products purchase from either Canada or USA.

## **4.0 PAINT OPTION 2: YOLO Colorhouse**

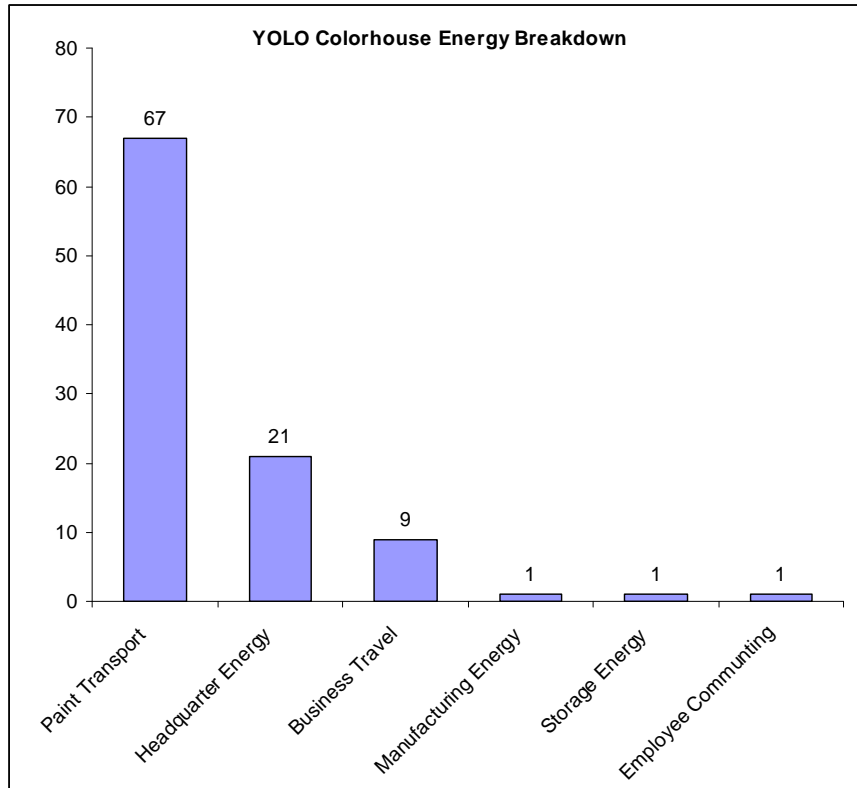
YOLO Colorhouse produces a zero-VOC acrylic line of paints that meet Green Seal standards. The company was founded on the principles of quality and sustainability. From social and environmental all the way to economic, YOLO looks as good on paper as it does on the wall. This section of the report will cover a brief TBLA performed on YOLO. Specifically, it will cover the various environmental, social, and economic factors associated with YOLO's paint products.

### **4.1 Environmental Factors:**

YOLO strives to identify the breakdown of its energy footprint. Transportation weighs in at 67%. In an effort to reduce its carbon footprint YOLO joined the US EPA SmartWay program, which promotes the use of rail whenever possible and encourages truckers of their products to use bio-diesel fuel. YOLO is the first paint company to join the US EPA SmartWay Transportation Alliance. They also aim to reduce their overall footprint by means of employee transportation incentives for carpooling, bicycling and other carbon reduced practices. While the energy used by the company comes from the Oregon power grid, the carbon footprint is abated by means of purchasing wind power for their operations.

The product comes from the North-western United States, and transportation to Vancouver could be by way of container on truck or train. The product is trans-geographically close to UBC.

The following figure provides a breakdown of YOLO's energy consumption:



**Figure 2 - YOLO Colorhouse Energy Consumption Breakdown**

The products are approved for disposal in a landfill, but nothing is mentioned on the biodegradability.

There is no information available on the renewability of the raw materials used.

All of the YOLO products are zero-VOC and do not off-gas toxic compounds. The products are listed by OSHA under the hazardous communication standard but they do not list any carcinogens or toxic compounds. The ingredients of the YOLO paints are listed on the TSCA inventory. They use precautionary principles when chemicals are not regulated, and there is sufficient evidence in literature of possible health effects.

YOLO Colorhouse paints do not contain:

- carcinogens
- reproductive toxins
- mutagens
- hazardous air pollutants
- ozone depleting compounds
- formaldehyde



- phthalates
- VOC's

The company makes use of 100% PCR paper for labels and packaging, printed with soy ink and the paint containers are made using PCR plastics. Furthermore, the displays are constructed using cardboard and wheat-board.

In the manufacturing processes, steps are taken to reduce and reuse. For example, the wash water used to rinse the tanks is recycled back into paint.

## **4.2 Social Factors**

The employees are compensated according to US and Oregon laws and standards. These standards meet or exceed the ILO labour standards. Furthermore, the company outlines that they foster environmental and social values in the workplace. They are committed to diversity in the workplace and appreciate diversity.

The company offers transportation initiatives for employees that abate CO<sub>2</sub> production in their commute to work. The company reports that more than half of the employees commute by bicycle when it is possible. This is in line with the ILO green jobs initiative for Greener enterprises.

Emissions released by the product include titanium dioxide, but do not include VOC's. The emission rates meet both LEED and Green Seal GS-11 standards.

The company website offers links to the MSDS sheets for all of their products, this helps to empower consumers to make well informed decisions and avoid the new phenomenon of green-washing.

The company also helps educate the consumer by:

- providing information on an appropriate amount of product needed in order to minimize waste
- suggesting adequate ventilation levels for painting and drying
- providing resources for proper disposal and recycling opportunities

## **4.3 Economic Factors**

The YOLO Colorhouse acrylic paints are held to high quality standards. The paints meet the GS-11 standards for:

- Adhesion
- Flow and levelling
- Hiding power
- Corrosive resistance
- Scrubbability
- Washability
- Fade resistance
- Accelerated weathering
- Flexibility
- Solar reflectance

The performance standards contribute to a long product life and in turn a lower lifecycle cost. Because the product is produced trans-geographically close to UBC, the delivery cost is relatively small as compared to other products.

The YOLO products retail between:

- Interior: US\$ 1.16 (CAD\$ 1.17) / square meter
- Exterior: US\$ 1.38 (CAD\$ 1.39) / square meter
- Primer: US\$ 0.98 (CAD\$ 0.99) / square meter

## 5.0 PAINT OPTION 3: Homestead House Paint Company, Inc.

Homestead House Paint Company Inc. is a Canadian company based out of Toronto, Ontario that produces eco-friendly paint products. Originally a furniture refurbishment company they slowly paved themselves the way into paint production. Currently their line consists of VOC-free latex paint, VOC-free milk paint, eco-friendly stain and eco-friendly hemp oil finish. This section of the report will focus on the milk paint, keeping in mind that milk paint can only be applied to porous surfaces such as wood or plaster. This section of the report will cover a brief TBLA performed on Homestead. Specifically, it will cover the various environmental, social, and economic factors associated with Homestead's paint products.

### 5.1 Environmental Factors:

The Homestead House Paint Company manufactures and produces all their paints in Toronto, Ontario, Canada. The ingredients used are all natural and obtained locally based on availability.<sup>21</sup> Since the ingredients are all natural the milk paint is VOC free<sup>22</sup> and has once applied to the wall has no impact through emissions on the environment.

The raw ingredients used in milk paint are casein (milk protein), limestone, clay and natural pigments used to add color to the paint. The natural pigments can be obtained from roots, berries, seeds, coal, and minerals.<sup>23</sup> The Homestead House Paint focuses on obtaining all their ingredients locally such as the limestone which is available from Wiarton, Ontario, Canada.<sup>24</sup> The only questionable ingredient that they sometimes use is coal, which is used in order to achieve darker pigments. Coal is a non-renewable material and the mining process of coal is environmentally destructive such as mountaintop mining and strip mining, impacting land and water use surrounding the mine.

Since all the raw materials are found within the same province, transportation of the raw materials is minimal. Transportation of the final product across Canada to Vancouver, BC assuming it is by truck will emit CO<sub>2</sub> over approximately 3400 km. The milk paint comes in powder form, and therefore requires less packaging and weighs less, making transportation more cost-effective.

The unused paint is safe to be disposed of down the drain or in a composter since all ingredients are natural and biodegradable.<sup>25</sup>

Considering this paint is produced and manufactured in Ontario, the energy requirements to produce this paint come from a mixed grid power source including nuclear, coal, oil, water power, natural gas, wind, solar and biomass.<sup>26</sup>

## **5.2 Social Factors**

Homestead House Paint Company is a part of Green Enterprise Toronto (GET). GET is a green business alliance within the city of Toronto supporting smaller to mid sized business to achieve sustainable status. GET has a set out mission to promote “healthy environment, strong communities, meaningful work, buying local first and fair trade.”<sup>27</sup>

Since both the raw and final product is Canadian, the labour practices used in the extraction of the raw materials and production of the final product both follow Canadian labour standards. Thus, providing standards for equality, fair compensation health, safety etc. in the workplace.<sup>28</sup> However, there are health hazards associated with coal mining and extraction even while done under the Canadian labour standards. However, the quantity of coal required for this process is minimal.

The milk paint produced by the Homestead House Paint Company is VOC free and therefore does not emit harmful chemicals during or after painting. Also milk paint naturally prevents the growth of mould and mildew due to its alkaline properties.<sup>29</sup> Also, once the paint has dried, it is odour free.

## **5.3 Economic Factors**

Milk paint is quite durable, it never chips or peels<sup>30</sup> and its lifespan can also be extended greatly with a coat of sealer. Homestead House Paint Company also has eco-friendly paint sealers available.

As mentioned before, the milk paint comes in powder form and will need to be mixed well with water and, once mixed, used within a day or else it spoils and requires disposal.

The paint dries quickly within an hour and usually about two coats are required therefore a room can be done within a day and no long waiting times are required.

The price point of the milk paint ranges from \$0.06 to \$0.10 (CAD) per gram depending on purchase amount, and with a greater quantity the price is less. The coverage varies based on darker and lighter paints, for lighter paints the coverage is approximately 6 grams of paint per square foot and for darker paints it is approximately 3 grams of paint per square foot. Therefore the price per square meter varies from two to six dollars depending on the paint and quantity.<sup>31</sup>

Since the paint is available in Canada, transportation costs to get the paint to UBC will be approximately \$10 (CAD) per gallon.<sup>32</sup>

## 6.0 DECISION MATRIX

Table 1 – Decision Matrix for the Three Candidates

Evaluation Criteria	AURO	YOLO	Homestead
<i>Social</i> (35%)			
Extracting Work Conditions	2	2	3
Manufacturing Work Conditions	3	3	3
Sustainability Initiatives	2	3	2
Off-gasses to the End User	3	3	3
<b>Sum</b>	10	11	11
<b>Score</b>	0.83	0.92	0.92
<i>Environmental</i> (35%)			
Sustainability Initiative	3	2	3
Renewability of Raw Resources	3	1	3
Transportation of Product from Manufacturing to Distribution	3	3	3
Trans-geographical Distance from Distribution to the End User	1	3	2
Recycleability of product	3	2	3
Toxicity of Compounds in Product	3	3	3
Harmful Compounds in Product	2	2	3
Toxicity of Energy Used for Production	3	3	2
Toxicity of Energy Used in Distribution	3	3	2
Off-gassing of Harmful Compounds	3	2	2
Off-gassing of Toxic Compounds	3	3	3
Leeching of Harmful Compounds Once Disposed	3	1	2
Leeching of toxic compounds once disposed	3	3	2
Manufacturing Uses a Mixed/Green Energy Grid	3	3	2
Distribution Uses a Mixed Energy Sources	2	3	2
Renewability of Energy of Production	2	3	2
Renewability of Energy of Distribution	1	2	1
<b>Sum</b>	38	37	36
<b>Score</b>	0.75	0.73	0.71
<i>Economic</i> (30%)			
Product Life Span	2	2	3
Trans-Geographical Distance	1	3	2
Nominal Cost	3	2	1
Nominal Cost of Delivery	1	3	2

<b>Sum</b>	7	10	8
<b>Score</b>	0.58	0.83	0.67
<b>Total Final Score</b>	72.7	82.7	77.2

## 7.0 CONCLUSION AND RECOMMENDATION

After considering the social, environmental and economic factors outlined in the methodology section, the team recommends YOLO paint to be used in the new and existing SUB.

AURO is the cheapest paint and is the only paint company advertised to be carbon neutral. However, the distance the product has to traverse (being shipped from Europe) makes it less economical and environmentally unattractive.

The milk paint by Homestead paint is the only Canadian paint and is all natural and environmentally friendly. However, the company does not outline any social incentives it is taking and the price point is not as competitive as other paints.

YOLO has shown to take sustainability incentives socially and environmentally. The paint is competitively priced and is trans-geographically close to the target location.



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