NATIONAL REPORT

LEAD IN NEPAL'S NEW ENAMEL HOUSEHOLD PAINTS

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Lead in Nepal's new enamel household paints

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Lead in Nepalese Household Paint

Foreword

This report presents new data on the lead content of new enamel decorative paints for sale on the Nepalese market. This is the third time Centre of Public Health and Environmental Development (CEPHED) has coordinated studies in Nepal where paints are analyzed to establish their lead content. The first study was conducted in year 2010 and included 13 enamel paints purchased in Nepal; the second was conducted in 2011 and included 12 enamel paints from multinational brands sold in Nepal.

The first study in 2010 was the starting point for a campaign for lead free paints in Nepal with the broad objective to phase out the manufacture and sale of paints containing lead, in order to prevent Nepalese children's exposure to lead via paints containing lead as well as to minimize occupational exposure to lead in paint. Key activities include spreading awareness among relevant stakeholders and initiating dialogue with policy makers on chemical safety.

The study in 2011 was carried out to determine whether lead levels vary in identical brands of enamel decorative paints available in in different countries in South Asia. Therefore, the Nepalese results were compared with the same paints in Bangladesh and India. It was also carried out to assess whether or not manufacturers had taken steps to phase-out lead in their paints after the 2010 results were made public.

In this report, we present findings from this most recent study analyzing enamel decorative paints to determine their lead content, and we compare these results with the results from the 2010 and 2011 studies. We also review national policy frameworks that are in place to ban or restrict the national manufacture, import, sale and use of enamel decorative paints and how changes in lead levels in paints may have resulted from changes in that regulatory framework since the last study.

The report also presents background information on why the use of household paints with high lead content is a source of serious concern, especially to children's health. And it proposes recommendations for taking action to protect children and others from lead in paint.

This report was prepared by Centre of Public Health and Environmental Development (CEPHED) with support and assistance from the Asian Lead Paint Elimination Project. The Asian Lead Paint Elimination Project has been established to eliminate lead in paint and raise widespread awareness among business entrepreneurs and consumers about the adverse human health impacts of lead-based decorative paints, particularly on the health of children under six years old.

The Asian Lead Paint Elimination Project is being implemented by IPEN over a period of three years in seven countries (Bangladesh, India, Indonesia, Nepal, Philippines, Sri Lanka, and Thailand) with funding from the European Union (EU) totaling €1.4 million. While this

publication has been produced with the assistance of the European Union, the contents of the publication are the sole responsibility of CEPHED and can in no way be taken to reflect the views of the European Union. In addition, this document was produced with financial contributions from the Swedish Environment Protection Agency, Swedish public development co-operation aid through the Swedish Society for Nature Conservation, SSNC. The views herein shall not necessarily be taken to reflect the official opinion of any of these donors, including SSNC or its donors.

CEPHED is an environmental NGO established in the year 2004, by and through the contribution, coordination from a group of activist and experienced people from medical, environment and public health sectors. CEPHED's focus is to serve the Nepalese people and communities in the field of public health and environment. CEPHED has adopted the vision of acting as a bridging forum between people and science and technology, to make new scientific knowledge, technology and safety measures of environment and public health sector accessible through research, coordination, capacity building and policy dialogue, etc.

CEPHED works within Nepal to bring the experience from people and organizations on the ground to the concerned authorities' notice in order to develop meaningful and sustainable solutions. In the past 9 years CEPHED has been engaged in research, awareness raising, capacity building, policy influence (especially in the areas of chemical management), pesticides, obsolete pesticides, healthcare waste, persistent organic pollutants (POPs), and heavy metals like mercury, lead and cadmium. With its growing interest and engagement with various environmental issues of national and international importance, CEPHED has become an active participating organization in several global networks working in the area of public health, environment and toxic free future. CEPHED is a member organization of Toxics Link, IPEN, the Global Alliance for Incinerator Alternatives (GAIA), Healthcare Without Harm, Collaborative on Health and the Environment (CHE), the Zero Mercury Working Group (ZMWG) and the World Alliance for Mercury Free Dentistry (WAMFD).

IPEN is an international NGO network of health and environmental organizations from all regions of the world in which CEPHED participates. IPEN is a leading global organization working to establish and implement safe chemicals policies and practices to protect human health and the environment. Its mission is a toxics-free future for all. IPEN helps build the capacity of its member organizations to implement on-the-ground activities, learn from each other's work, and work at the international level to set priorities and achieve new policies.

The European Union is made up of 27 Member States who have decided to gradually link together their know-how, resources and destinies. Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development, while maintaining cultural diversity, tolerance and individual freedom. The European Union is committed to sharing its achievements and its values with countries and people beyond its borders.

LIST OF ACRONYMS

° C	degree Celsius
AES	Atomic Emission Spectrophotometer
CEPHED	Centre of Public Health and Environmental Development
CHE	Collaborative on Health and the Environment
DoE	Department of Education
ELPAT	Environmental Lead Proficiency Analytical Testing
EU	European Union
GAIA	Global Alliance for Incinerator Alternatives
GAELP	Global Alliance to Eliminate Lead Paint
ICCM	International Conference on Chemicals Management
IPEN	International POPs Elimination Network
mg	milligram
mL	milliliter
MoE	Ministry of Education
MOSTE	Ministry of Science, Technology and Environment
NBSM	Nepal Bureau of Standard and Metrology
NS	Nepal Standard
ppm	parts per million
SME	Small and Medium sized Enterprises
SSNC	Swedish Society for Nature Conservation
UNEP	United Nations Environmental Programme
WAMFD	World Alliance for Mercury Free Dentistry
WHO	World Health Organization
ZMWG	Zero Mercury Waste Group

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Executive Summary

From October 2012 to March 2013, the Nepal NGO Center for Public Health and Environmental Development (CEPHED) purchased 49 cans of enamel decorative[1] paints from stores in and around Kathmandu, Pokhara and Butwal. Samples from each paint can were analyzed to determine their lead content by a laboratory in Italy accredited by ACCREDIA – the Italian Accreditation System. The lab participates in the Environmental Lead Proficiency Analytical Testing (ELPAT) proficiency testing program operated by the American Industrial Hygiene Association under a system created by the US Environmental Protection Agency. Paints from 21 paint brands were analyzed. The results were compared with previous studies of lead levels in Nepalese household paints conducted in 2010 and 2011.

Summary of Results of paint lead levels in Nepal

Analyzed Samples

71 percent of paints sold in Nepal have lead levels above the proposed 90 ppm limit and would not be permitted for sale in the United States. Dangerously high lead concentrations (over 10,000 ppm) were found in 29 percent of all paints analyzed.

Of the 49 analyzed enamel paints, 71 percent (35 paints) had lead levels above 90 parts per million (ppm) dry weight; 65 percent (32 paints) levels above 600 ppm; and 29 percent (14 paints) had dangerously high levels above 10,000 ppm. The highest lead level detected was 130,000 ppm.

Colors

Green, red, yellow and blue color paints are the most likely to contain dangerously high levels of lead.

The brightly colored paints (green, blue, red and yellow) most frequently contained high lead levels. 83 percent of the green paints, 80 percent of the blue and yellow paints and 75 percent of the red paints had lead levels above 90 ppm. In addition, the yellow and the green paints had the highest lead concentrations with averages of 50,200 ppm and 36,800 respectively. Although white paints generally contain less lead, more than half (63 percent, 19 out of 12) of the white samples had lead levels above 90 ppm.

Paint Brands

Most paint brands in Nepal sell paint above the proposed acceptable level of 90 ppm and more than half of the brands (57 percent, 21 out of 12 brands) sell paints with dangerously high levels above 10,000 ppm.

[1] The term "*decorative paint*" as used in this study refers to paints that are produced for use on inside or outside walls and surfaces of homes, schools, commercial buildings and similar structures. The term "*enamel*" as used in this study refers to oil based paints.

Lead above the proposed acceptable limit of 90 ppm was detected in paint samples from 16 of the 21 brands included in the study. At least one samples from 15 brands had paint samples with lead levels above 600 ppm and 12 brands had paint samples with lead levels above 10,000 ppm. All paints analyzed from five brands contained lead levels below 90 ppm, suggesting that the companies producing these paints had the technology to produce non-leaded paint.

Comparison with previous studies

The study presented in this report includes a larger number of paints and brands than in previous studies, but all studies have shown that dangerously high lead concentrations in analyzed enamel paints are easily available on the Nepalese market.

Paints from nine manufacturers that were included in the 2013 study were also analyzed in 2010 or 2011, or both. Out of these nine, paints from four of them have consistently contained high lead concentrations in all studies, whereas paints from two of them showed reduced lead levels in the current study compared to the previous results. In 2013 study, average lead content is found to be 16,600 ppm which was 12,100 ppm in 2010 and 28,400 ppm in 2011.

In 2010, highest lead concentration was 74,000 ppm which was lower than 2, 12,700 ppm (2011) and 1,30,000 ppm (2013). According to study in 2010, only 15 percent of samples had lead concentration lower than 90 ppm whereas in 2011 and 2013, percentage increases to 33 and 29 respectively.

This finding suggests that as long as Nepal continues to have no rules, regulations or policies to limit the lead contain in household paints, many paint manufacturers will not voluntarily remove the lead from their paint production.

Conclusions & Recommendations

This study demonstrates that common enamel household paints with high levels of lead are still widely available on the Nepalese market. Although studies in 2010 and 2011 called for action by showing high lead levels in enamel paints, the average of lead in the paints included in this study still remains very high at 16,600 ppm. In addition, this study shows that paints with levels as high as 130,000 ppm (dry weight) are still sold for household use.

Only two of the nine brands included in this study that were also previously analyzed have reduced the lead content in their paints, whereas the paints from four brands still contains high lead levels. In 2010, only 15 percent of samples had lead concentration lower than 90 ppm whereas in 2011 and 2013, percent increases to 33 and 29 respectively. This shows that without enforced legislation limiting the lead content of enamel decorative paints, many manufacturers will continue to sell paints with dangerously high levels of lead. If same situation continues for

coming years, children who are also building block of country are in danger zone from health perspective.

The issue of lead in paint has been a prioritized issue in most highly industrialized countries for many decades, but the government of Nepal has, until recently, not taken this problem seriously. However, a number of governmental bodies such as Ministry of Science, Technology and Environment (MOSTE), Nepal Bureau of Standard and Metrology (NBSM), and Department of Education (DOE) have now taken some initial steps to collaborate with representatives from civil society to formulate a standard for lead content of household paints, create policies, persuade paint manufacturers to remove lead from their paints, and raise mass awareness through school networks. Last year (2012) NBSM also analyzed some paint brands for their lead content, which further shows governmental initiative to solve the problem related to intentional addition of lead in paint. Likewise, the NGO LEADERS in Nepal has also recently carried out a study of lead in 75 enamel paints, and their results are helping to raise awareness of the issue.

Finally, several paint manufacturing companies, mainly multinational, have recently started to voluntarily remove lead from their paint manufacture. Currently, there are four different paint manufacturers advertising that they are supplying paints with symbol in its paint can "No ADDED LEAD" to the market.

Key recommendations:

CEPHED recommends the following actions to continue the efforts to protect the Nepalese children:

- The Nepal government must
    - Enact a mandatory standard for lead in household paints.
    - Provide support to small and medium-sized paint manufacturers for paint analysis, to remove lead from their paint production, and support awareness programs related to the hazard of leaded paints.
    - Should bring awareness program on Impact of lead in Human Health issues.
    - Require paint cans to be properly labeled with details of paint ingredients and to alert users to the hazards of lead-contaminated dust and other materials when previously painted surfaces are scraped or sanded in preparation for repainting.
    - To ensure the consumer to buy Lead Free Paints, 3rd party certification must be enacted.

- All stakeholders (e.g. civil society, education professionals, healthcare professionals and media) must work actively and collaborate with each other to spread public awareness on the issue of leaded paints.
- There is an urgent need for third party certification to ensure that the paints consumers purchase are lead-free.
- Consumers should always ask for paints without lead to protect the health of their families.
- Consumer should always check the labeling whether paint they are going to purchase is Lead Free or Not in order to protect their family and children's health.

1. Introduction and Background to the Lead Paint Issue

Lead is a toxic metal, which can be found in paints when a paint manufacturer intentionally adds one or more lead compound to the paint for some purpose. The lead compounds most commonly added to paint are pigments that give the paint its color. Lead compounds commonly used as paint pigments include: lead chromates, lead oxides, lead molybdates, and lead sulfates. These are added to produce bright colors such as yellow, red and green. Lead compounds may also be added to paint to serve as drying agents and catalysts in oil-based paints. These make the paint dry faster and more evenly. Lead-based corrosion resistance agents are sometimes added to paints that are used on metal surfaces in order to inhibit rust and corrosion. The most common of these is lead tetroxide, sometimes called red lead or minium.

Good, cost-effective substitutes for all the lead compounds that are used in making household paints have been widely available since the 1980's and before. Any paint manufacturer that currently produces household paints with added lead compounds could easily reformulate its paints using these substitutes with very little (if any) impact on the characteristics of the paints they produce or on the price. There is no good reason for a paint manufacturer to continue producing paints with added lead compounds, especially since the childhood health hazards associated with lead paint are very serious and well-documented.

When a paint manufacturer does not intentionally add lead compounds in the formulation of its paints, the lead content of the paint will be very low – almost always less than 90 parts per million (total lead, dry weight). If a paint manufacturer is careful in selecting ingredients that do not contain lead as a contaminant, the lead content of the paint will often be as low as 10 parts per million of less.

In almost all cases where recent studies have been conducted, water-based paints (sometimes called latex or acrylic paints) do not contain added lead. On the other hand, in most developing countries and countries with economies in transition where paints have recently been analyzed for their lead content, many of the oil-based paints (sometimes called enamel paints) contain high lead content. For this reason, the current study Lead in Nepalese Household Paint, selected to only analyze oil-based paints for lead content.

2. Lead Exposure to children and its Health Effects

Children are not generally exposed to lead from paint while the paint is still in the can or even when the paint is being newly applied to a previously unpainted or uncoated surface. Rather, the lead exposure generally occurs after the lead paint has already dried on the wall or on the article that has been painted.

Painted surfaces age, weather, and chip with time. Any lead that is in the paint then enters indoor and outdoor dusts and soils in and around the painted home or building. Children have an innate curiosity to explore their world and engage in developmentally appropriate hand-to-mouth behavior. When playing in lead contaminated environments, the dust and soil that they ingest will carry lead. This is especially true for children in the six years and under age group, the group most easily harmed by exposure to lead. For example, a typical one to six year old child ingests approximately 100 milligrams of house dust and soil each day.[2]

Figure 1. Paint Chips

Paint chips can be especially harmful since their lead content can be much higher than what is typically found in dust and soils. In some cases, children may pick up paint chips and put them into their mouth. In addition, when toys or other articles are painted with lead paint, children may chew on them and directly ingest the lead-contaminated dried paint. However, the most common way in which children ingest lead is thought to be through lead-containing dust.

Children and workers are especially at risk when surfaces that were previously painted with lead paint are repainted or disturbed by construction or other activities. Workmen may sand, dry scrape, grind, or in other ways disturb the old painted surface and produce large quantities of dust with very high lead content.

Exposure to lead is much more harmful to children than adults, and the health effects are generally irreversible and can have a lifelong impact.[3] The younger the child, the more harmful lead can be. The human fetus is the most vulnerable and a pregnant woman can transfer lead that has accumulated in her body to that of her developing child. That means that lead can poison several generations, and not only one person during active exposure.

Children are more biologically susceptible to lead than adults for several reasons including:

- A child's brain undergoes very rapid growth, development and differentiation and lead interferes with this process. Brain damage caused by chronic, low-level exposure to lead during early years is irreversible and untreatable.
- Exposure to lead early in life can re-program genes, which can lead to altered gene expression and an associated increased risk of disease later in life.
- Gastrointestinal absorption of lead is enhanced in childhood. Up to 50 percent of ingested lead is absorbed by children, as compared with 10 percent in adults. (Pregnant women may

[2] World Health Organization, 2010. *Childhood Lead Poisoning*, p.18. http://www.who.int/ceh/publications/leadguidance.pdf

[3] World Health Organization, 2010. *Childhood Lead Poisoning*, p.12.

also absorb more ingested lead than other adults). In those children who suffer from nutritional deficiencies, ingested lead is absorbed at an even more increased rate.

Evidence of reduced intelligence caused by childhood exposure to lead has led the World Health Organization to list "lead caused mental retardation" as a recognized disease. WHO also lists it as one of the top ten diseases whose health burden among children is due to modifiable environmental factors.[4]

In recent years, medical researchers have been documenting significant health impacts on children from lower and lower lead exposures.[5] In response, the U.S. Centers for Disease Control and Prevention (CDC) and other authorities have concluded that there is no known acceptable lead exposure level for children[6].

A recent study that investigated the economic impact of childhood lead exposure on national economies estimated a total cumulative cost of $977 billion international dollars[7] per year for all low and middle income countries.[8] The study considered the neurodevelopmental effects on lead-exposed children, as measured by reduced intellectual quotient (IQ) points and correlated lead exposure-related reductions in children's IQ scores to reductions in their lifetime economic productivity as expressed in the child's lifelong earning power. The study identifies many different sources of lead exposure in children with lead paint as one "major source." Broken down by region, the estimated costs of childhood lead exposure were:

- Africa: $134.7 billion of economic loss or 4.03% of Gross Domestic Product (GDP)

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[4] World Health Organization, 2006. *Preventing disease through healthy environments*, p. 6. http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf

[5] Needleman, H., 2004. *Lead Poisoning*. Annu. Rev. Med. 55, 209–22. http://www.rachel.org/files/document/Lead_Poisoning.pdf

[6] Scientific Opinion on Lead in Food, EFSA Panel on Contaminants in the Food Chain (CONTAM), EFSA Journal 2010. http://www.efsa.europa.eu/en/efsajournal/doc/1570.pdf

[7] An International dollar is a currency unit used by economists and international organizations to compare the values of different currencies. It adjusts the value of the U.S. dollar to reflect currency exchange rates, purchasing power parity (PPP) and average commodity prices within each country. According to the World Bank, *"An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States."* The international dollar values in this report were calculated from a World Bank table that lists GDP per capita by country based on purchasing power parity and expressed in international dollars. The data from the table (at: http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD) was accessed by the report's authors in February 2012.

[8] *Economic Costs of Childhood Lead Exposure in Low- and Middle-Income Countries,* by Teresa M. Attina and Leonardo Trasande: Environmental Health Perspectives; DOI:10.1289/ehp.1206424; http://ehp.niehs.nih.gov/1206424/

- Latin America and the Caribbean: $142.3 billion loss in Latin America and the Caribbean or 2.04% of GDP
- Asia: $699.9 billion loss or 1.88% of GDP
- Nepal: $ 1,533,245,125 loss or 4 % of GDP (38,302,000,000 US$)

3. Global Lead Paint Elimination Efforts

The use of lead in household paints is a matter of global concern. At the International Conference on Chemicals Management (ICCM) held in 2009, lead paints were identified by consensus to be international priority issues of concern. Representatives of the Government of Nepal participated in this conference as observers.

In response to the ICCM decision, the United Nations Environmental Programme (UNEP) and the World Health Organization (WHO) jointly initiated a global partnership to eliminate the use of lead compounds in paints in order to protect public health and the environment. This partnership is called the Global Alliance to Eliminate Lead Paint (GAELP), and it´s overall goal is to prevent children's exposure to lead via paints containing lead and to minimize occupational exposures to lead in paint. GAELP's broad objective is to phase out the manufacture and sale of paints containing lead and, eventually, to eliminate the risks from such paint.

In 2012, the third meeting of the ICCM was held. A representative of the Government of Nepal also participated as observer in this meeting. The Conference agreed by consensus to call upon governments, civil society organizations, and the private sector to contribute to GAELP in various ways including by:

- Raising awareness about the toxicity to human health from lead in paint including for young children, paint users, and the workers in paint production facilities;
- Filling information gaps by analyzing paints for their lead content in countries where little or no data are available;
- Promoting national regulatory frameworks, as appropriate, to stop the manufacture, import, export, sale and use of lead paints and products coated with lead paints;
- Encouraging paint manufacturing companies to substitute lead compounds added to paint with safer alternatives; and
- Establishing prevention programs to reduce exposure in and around housing, childcare facilities, schools and other buildings where lead paint has been used in the past.

4. Nepalese Framework for Eliminating Lead Paint

Most highly industrial countries enacted laws, regulations or mandatory standards to protect the health of their people in the 1970's and 1980's. These laws generally prohibit the manufacture, import, sale or use of lead paint for interiors or exteriors of homes, schools and commercial buildings. In recent years, these regulations have become increasingly stringent. The standard adopted by the United States imposes an upper limit of 90 parts per million (ppm) on total lead (dry weight) for house paints and many other paint categories. Other countries have adopted mandatory limits in the range of 90 to 600 ppm total lead (dry weight). NGOs associated with the IPEN network generally promote the 90-ppm standard as one that is fully achievable and maximally protective.

For decades, household paints that are produced for sale in highly industrial countries have not used added lead compounds as pigments, drying agents or for other purposes. Most paint manufacturers that produce paints for sale in the developing world know the reason why. It is unfortunate that lead paints for household use are still being produced, sold and used. This practice must now end.

Regulatory Framework:

No regulations or laws exists in Nepal specifically limiting lead in household paint. However, the umbrella Interim Constitution in place recognizes the right to live and the right to a healthy environment as fundamental rights of the people. However, there are voluntary standards that refer to enamel paints. Nepal has a voluntary standard, Nepal Standard 112: 2043 (part 1, 1986), which refers to enamel paint for exterior protection and decorative finishing purposes. Unfortunately, there is no requirements regarding lead content in paint to receive the Nepal Standard (NS) mark.

Paint brands in Nepal

In recent years, paint sales have grown rapidly. According to few studies and statistical analysis, it's increasing at annual rate of 35 percent.[9]

In current scenario, there are around 100 paint industries registered in name of small and medium industries, unfortunately only 30 around paint industries are currently operating in Nepal. The four major paint brands sold in Nepal are Asian Paints, Berger Jenson & Nicholson, Pashupati Paints and Nepal Shalimar Paints. According to their own estimates, Asian Paints is the leading

[9] http://www.ekantipur.com/2012/05/16/top-story/paint-manufacturers-optimistic-despite-political-uncertainty/354027.html

Rands

paint manufacturer in terms of domestic market share with 40 percent followed by Berger Jenson & Nicholson (27 percent), Pashupati Paints (20 percent), and Nepal Shalimar Paints (13 percent).[10] However, the actual numbers are somewhat lower since other players also are active on the Nepalese paint market. Since the article was published, Nepal Shalimar paints have merged with Kansai Nepal

Domestic products such as Asian, Berger Jenson & Nicholson, Pashupati, Apollo, G7 Paint, etc. account for up to 70 percent of market share. Imported paints make up about 30 percent of the national market, with the majority from India, China, Thailand, Singapore and USA.[11]

According to Nepal Rastriya Bank, paint imported from India alone was worth 886 million Nepalese Rupees in fiscal year 2012.[12] Small and medium-sized paint manufacturers (SMEs) primarily serve local markets, which makes their percentage of market share hard to obtain. Among the different types of paint sold, a fifth are enamel decorative paints.

Of the brands included in the study, four are produced by multinational companies (Asian Paints, Kansai Paints, Berger Jenson & Nicolson and ICI Dulux) with production sites in Nepal (Asian Paints, Kansai Paints and Berger Jenson & Nicolson) and India (ICI Dulux); two brands are from Indian manufacturers (Modi Paints and Micolite paint); and the other 15 brands are produced by Nepalese manufacturers.

5. Materials and Methods

In 2013, the Nepal NGO, Center for Public Health and Environmental Development (CEPHED), with help and support from the international NGO network IPEN, purchased 49 cans of enamel decorative paints from stores in and around Kathmandu, Butwal and Pokhara. These paints were from 21 different brands. In most cases, selection was based on the availability of color in market, with a focus on bright colors such as red or yellow. The availability of these paints in retail

Figure 2 Paints included in 2013 Study

[10] http://www.ekantipur.com/2012/05/16/top-story/paint-manufacturers-optimistic-despite-political-uncertainty/354027.html

[11] Mr. Bishwo Prakash Shakh, President, Nepal Paint Manufactures Association's presentation " Lead in Paint, Issue, Challenges and Threat" at March 25, 2013, NBSM/MOI.

[12] http://www.ekantipur.com/2012/05/16/top-story/paint-manufacturers-optimistic-despite-political-uncertainty/354027.html

establishments suggested that they were intended to be used within home environments. Excluded were automotive and industrial paints that are not typically used for domestic housing applications or to paint toys.

Paint sample preparation kits containing individually numbered, untreated wood pieces, single-use brushes and stirring utensils made from untreated wood sticks were assembled and shipped to CEPHED by staff of the IPEN partner NGO, Arnika, in the Czech Republic. Each paint sample was thoroughly stirred in the can and applied by a separate unused single-use brush to duplicate, individual, numbered, unused, wood pieces by staff of CEPHED.

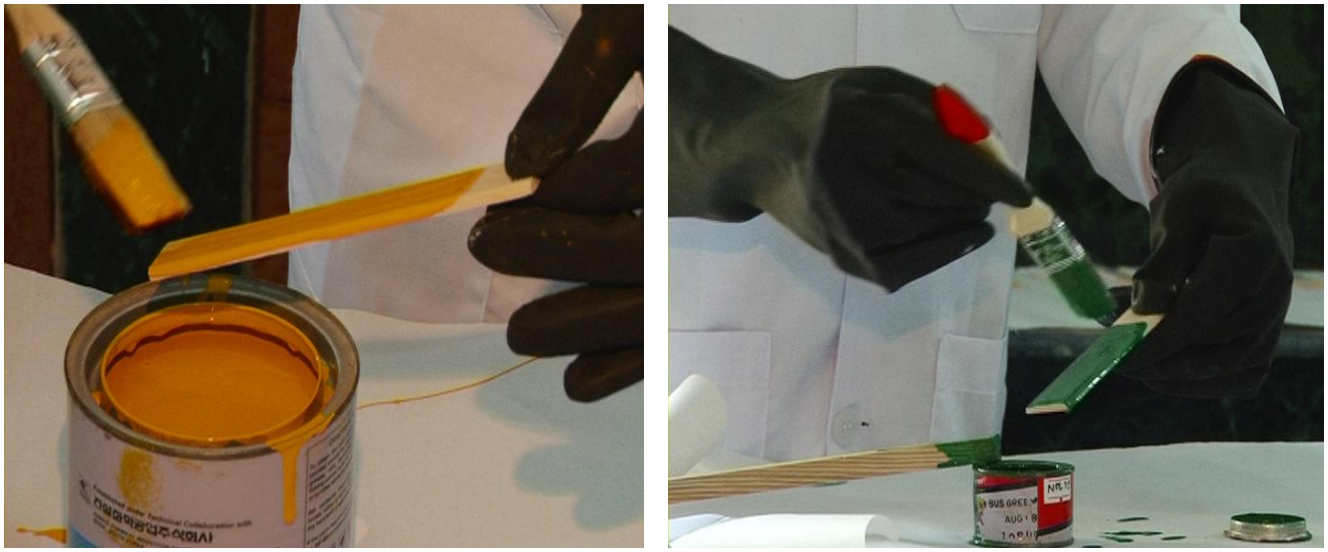

Figure 3.The Paint Sampling method

Each stirring utensil and paintbrush was used only once, and care was taken to avoid cross contamination. After drying, the wood pieces were placed in individual plastic bags and shipped for analysis of lead content to Certottica laboratory in Italy.

Figure 4. Dry painted coded wooden strip samples

Certottica is accredited by ACCREDIA – the Italian Accreditation System, which is the Italian National Accreditation Body appointed by the State. This laboratory participates in the Environmental Lead Proficiency Analytical Testing (ELPAT) program operated by the American Industrial Hygiene Association under a program established by the US Environmental Protection Agency.

At the laboratory, a quantity of paint was removed from the wood piece by abrasion. The paint was then weighed into a hot block digestion tube and the paint chips digested according to method CPSC-CH-E1003-09.1. The paint was placed in a beaker of borosilicate, in which were added 3 mL of HNO3 and 1 mL of 30% H_2O_2. The beaker was covered with a glass and heated on a hotplate (surface temperature of approximately 140 ° C, from 85 initially to 100 ° C) until most of the acid had evaporated. This treatment was repeated twice. The beaker containing the sample was removed from the plate and let cool to room temperature. In addition, the cover glass was rinsed with a quantity of HNO_3 10% from 3 to 5 mL and the solution left to evaporate slowly and cool to room temperature. Finally, 1 mL of HNO_3 was added to the residue, which was agitated to dissolve the soluble species. The walls of the beaker and the bottom of the cover glass were rinsed and the solution was transferred into a flask and brought to volume with deionized water.

Lead in the digestates was analyzed by an Atomic emission spectrophotometer (ICP-AES), Thermo Scientific iCAP 6000 Series, using yttrium (2 mg/L) as internal standard.

The laboratory's lower limit of detection for the lead concentration in the paint samples is dependent on the amount of paint in the samples. Generally, for 100 mg of paint scraped off the wood pieces the lowest detection limit is 8 ppm, but for a smaller amount of paint the detection limit increases. Therefore, the lead content in one of the samples is reported as below 9 ppm.

6. Results

71 percent of paints sold in Nepal have lead levels above the proposed 90 ppm limit and would not be permitted for sale in the United States or in other developed countries. Dangerously high levels of lead (above 10,000 ppm) were found in 29 percent of all paints tested.

A total of 49 cans of new enamel decorative paint from 21 brands were purchased from stores in and around Kathmandu, Pokhara and Butwal in Nepal, and analyzed to determine their lead content. The details of the paints are listed in appendix 1. The sample results are expressed as parts per million (ppm) total lead, based on the dry weight of the sample (Fig. 1, Appendix 2).

The average concentration of all analyzed paints was 16,600 ppm, which is 181 times more than the proposed acceptable limit of 90 ppm. Dangerously high lead concentrations above 10,000 ppm were found in 14 (29 percent) of the 49 enamel paints, 18 (37 percent) of the paints had lead

concentrations between 600 ppm and 10,000 ppm whereas three (6 percent) samples of enamel paints had concentrations between 90 ppm and 600ppm.

In sum, 71 percent of the paints had lead concentrations above 90 ppm and would not be permitted for sale in the United States. In addition 65 percent had lead concentrations above 600 ppm and would not be permitted for sale in most industrialized countries.

The highest concentration detected was 130,000 ppm, which is 1,444 times more than the proposed acceptable level of 90 ppm.

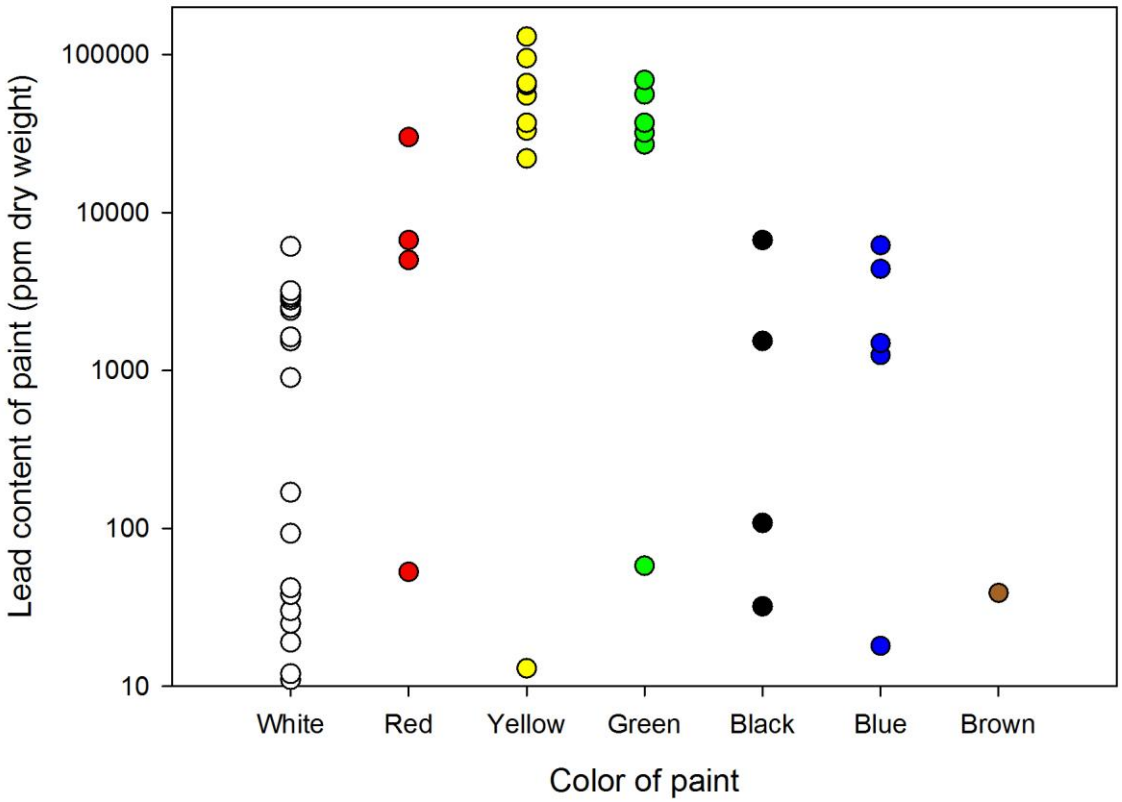

Figure 5. Lead content (in part per million dry weight) of the analyzed paints.
Please note that there is a tenfold increase in lead concentration between each major tick

Lead Concentration by Brand

Most paint brands in Nepal sell paints containing lead above the proposed acceptable level of 90 ppm, and more than half of the brands (57 percent, 12 out of 21 brand) sell paints with dangerously high levels above 10,000 ppm

Lead above the proposed acceptable limit of 90 ppm was detected in paint samples from 16 of the 21 brands included in the study (Table 1, appendix 2). Paint samples from 15 brands had lead levels above 600 ppm, and paint samples from 12 brands had lead levels above 10,000 ppm. One brand included a paint sample with the extremely high lead content of 130,000 ppm (i.e., 13 percent of the weight of the dry paint).

All paints from five brands contained lead levels below 90 ppm. Among these five are both national and multinational companies. In addition, two Indian companies produced paints with both very high lead content i.e. around 100,000 ppm,

Of the 49 samples,12 were from multinational companies, 4 from Indian manufacturers and 33 from Nepalese manufacturers. All four paints samples from Indian manufacturers, one of 12 samples (8 percent) from multinational companies, and 30 of the 33 (91 percent) paint samples from national manufacturers contained lead levels above 90 ppm.

Overall, 71 percentage of samples (35 out of 49) had lead level greater than 90 ppm, 65 percent (32 out of 49) had lead level higher than 600 ppm and 29 percent (14 out of 49) had lead level higher than 10,000 ppm. Among the tested sample and lead concentration, highest lead concentration was 130000 ppm which is 1444 times greater than the acceptable lead level (90 ppm).

Table 1 Lead concentration on sample grouped according to manufacturer

Paint Manufacturer	Number of Samples (color)	Brand headquarters	Number of Samples Above 90 ppm lead	Number of Samples Above 600 ppm lead	Number of Samples Above 10,000 ppm lead	Min. Ppm	Max. Ppm
Apollo Paints	2	Nepal	2	2	1	1,630	64,000
Asian Paints	5	India	0	0	0	< 9	58
Baba Paints	5	Nepal	5	5	1	6,100	69,000
Berger Jensen and Nicholson	2	India	0	0	0	11	13
Dalmia Paints	2	Nepal	2	2	1	1,540	32,000
G7 Paints	2	Nepal	2	2	1	2,400	37,000
ICI Dulux	1 (white)	India	0	0	0	30	
Kansai Paints	4	Japan	1	0	0	12	108
Krish Paints	1 (white)	Nepal	1	1	0	900	
Mahalaxmi Paints	1 (white)	Nepal	0	0	0	19	
Micolite	1 (white)	India	1	1	0	3,200	
Modi Paints	2	India	2	2	2		55,000
Nepal Paints	2	Nepal	2	2	1		66,000
Pashupati Paints	4	Nepal	4	3	2	169	130,000
Ratee Paints	4	Nepal	4	4	1		30,000
Reliance Paints	3	Nepal	3	3	1	2,500	37,000
Rukmani chemicals Industries	2	Nepal	2	1	1	93	95,000
Shalimar Paints	2	Nepal	2	2	1	2,900	33,000
Three Rifle Paints	1 (blue)	India	1	1	0	1,250	

Tirupati Paints	2	Nepal	1	1	1	42	22,000
Yeti Paints	1 (black)	Nepal	0	0	0	32	
Total number	**49**		**35**	**32**	**14**	**< 9**	**130,000**

Lead Concentration by Color

Green, yellow, red and blue color paints are the most likely to contain dangerously high levels of lead.

Green, yellow and blue color paints most frequently contained lead levels above 90 ppm (83 percent, 80 percent and 80 percent, respectively). (Fig 3, Appendix 3) At the same time, the only brown sample contained lead below 90 ppm. Both 75 percent of the red and black samples contained lead above 90 ppm and 63 percent of the white samples had lead levels above 90 ppm.

The range of the concentrations of lead in the paints and average lead concentration according to color is shown in Table 2. Yellow, green and red had the highest average concentrations of lead (50,200 ppm, 36,800 ppm and 10,400 ppm respectively). Blue had a high frequency of samples with a lead concentration above 90 ppm, but, at the same time, the average was in the same range as the black and white samples (2,700 ppm).

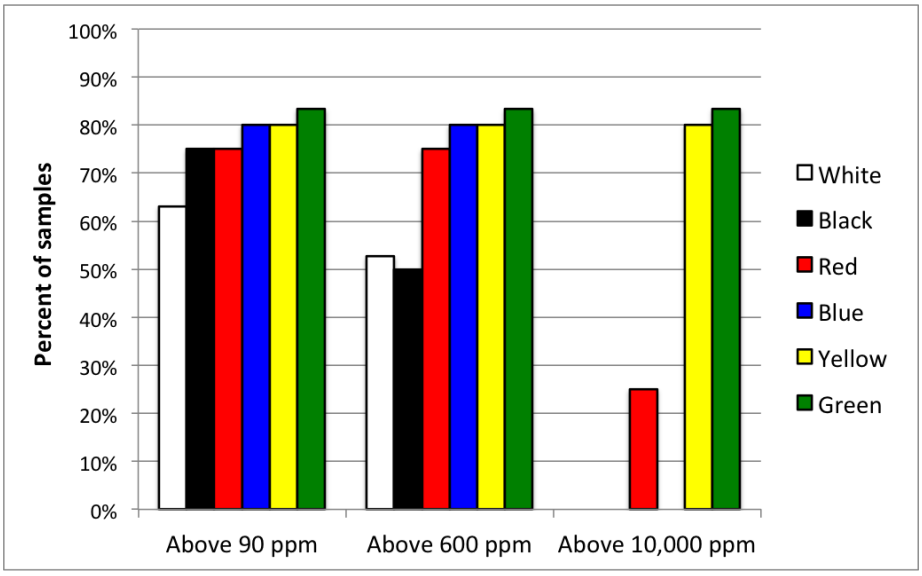

Figure 5 Lead concentrations in the analyzed paints arranged according to color

Table 2 Lead concentration in the analyzed paint samples according to color

Color	Number of samples	Average lead concentration (ppm)	Maximum lead concentration (ppm)	Minimum lead concentration (ppm)
Brown	1	39	39	39
White	19	1,443	6,100	11
Black	4	2,100	6,700	32
Blue	5	2,700	6,200	18
Red	4	10,400	30,000	53
Green	6	36,800	69,000	58
Yellow	10	50,200	130,000	8

Lead concentrations in labeled paint cans

No paints where the label indicated "No Added Lead" contained high levels of lead. However the Nepali Standard mark was no guarantee for low lead levels in the paint.

The labels of 12 of 49 of the analyzed paints included an indication of "No Added Lead", 20 of the paints included the Nepal Quality Certification Mark (NS Mark), and seven paints included both labels (Tab 3). The Nepal Bureau of Standards & Metrology (NBSM) awards this mark to Nepalese industries in order to motivate high quality goods produced according to relevant Nepalese standards and to enable Nepalese products to compete more efficiently in regional (or global) markets.

Paints indicating "No Added Lead" did not have high lead levels, even though this is a self certification and not verified by a third party or even by the concerned government agencies. The NS Mark does not include criteria for lead levels in paints, and it is evident that it does not safeguard against lead, since five of the 20 NS Marked paints contained very high lead levels (>10,000 ppm).

Table 3 Paint samples with labeling

Sample Number	Brand Name	Color of Paint	Parts Per Million Lead (dry weight)	Label indicating "No Added Lead"	NS mark
NPL-141	Asian Paints	Yellow	< 9	Yes	Yes
NPL-129	Kansai Paints	Black	108	Yes	No
NPL-130	Berger Jonson & Nicolson	White	11	Yes	Yes
NPL-127	Kansai Paints	White	12	Yes	No
NPL-145	Berger Jonson & Nicolson	Yellow	13	Yes	Yes
NPL-113	Pashupati Paints Nepolite	Yellow	130,000	No	Yes
NPL-114	Pashupati Paints Nepolite	White	169	No	Yes

NPL-153	Asian Paints	Blue	18	Yes	Yes
NPL-106	Reliance Paints	White	2,500	No	Yes
NPL-149	Nepal Paints	White	2,800	No	Yes
NPL-101	Shalimar paints	White	2,900	No	Yes
NPL-109	Asian Paints	White	25	Yes	Yes
NPL-108	ICI Dulux	White	30	Yes	No
NPL-102	Shalimar paints	Yellow	33,000	No	Yes
NPL-110	Kansai Paints	White	38	Yes	No
NPL-128	Kansai Paints	Brown	39	Yes	No
NPL-143	Reliance Paints	Blue	4,400	No	Yes
NPL-121	Pashupati paints Nepolite	Red	5,000	No	Yes
NPL-140	Asian Paints	Red	53	Yes	Yes
NPL-122	Pashupati Paints Nepolite	Green	56,000	No	Yes
NPL-142	Asian Paints	Green	58	Yes	Yes
NPL-146	Baba Paints	White	6,100	No	Yes
NPL-116	Baba Paints	Blue	6,200	No	Yes
NPL-104	Apollo Paints	Yellow	64,000	No	Yes
NPL-103	Nepal Paints	Yellow	66,000	No	Yes

Lead Concentrations in 2013 compared to previous studies

Though lead levels remain high, there is some improvement compared to earlier studies

The present study included paints from nine paint manufacturers that were also included in a similar study from either 2010 or 2011, or both (Tab. 4). It was not always possible to analyze the same colors for each brand as in previously studies, and therefore other colors from the same brand were selected.

In 2010, 88 percent of the paint samples from the nine brands analyzed contained lead levels above 90 ppm. In 2011, 67 percent of the brands had lead levels above 90 ppm. In the present study only 50 percent of the brands had lead levels above 90 ppm.

Of the four manufacturers represented in all three studies, two consistently had relatively low lead content, below 600 ppm (ICI Dulux and Kansai Nerolac).

Paint samples from the other two manufacturers included in all three studies (Asian Paints and Berger Jenson & Nicholson) contained high levels of lead (>600 ppm) in the 2010 and 2011 studies, but had reduced the lead content to below 90 ppm in all the paints sampled in the 2013 study. According to study in 2010, only 15 percent of samples had lead concentration lower than 90 ppm whereas in 2011 and 2013, percentage increases to 33 and 29 respectively.

Samples from four manufacturers included in both the 2010 and the current study (Pashupati Paints, Nepal Paints, Reliance Paints and Rukmani Chemical Industry) still show high levels of lead.

Table 4 Comparison of nine brands included in current and previous studies by CEPHED

		Lead concentrations (ppm)		
Brand	**Color**	**2010 Study**	**2011 Study**	**2013 Study**
Asian Paints	Orange	74,000	64,400	
	Green		190	58
	Yellow		190	< 9
	White			25
	Red			53
	Blue			18
Berger Jenson & Nicholson	Red	8,900	13,200	
	Green		49,700	
	Yellow		213,000	13
	White			11
ICI Dulux	Yellow		60	
	Orange		66	
	Green		70	
	White			30
Kansai Nerolac	Red		65	
	Yellow		100	
	Green		270	
	Black	5		108
	White			12
	White			38
	Brown			39

Pashupati Paints	Brown	3,100		
	Yellow			130,000
	White			169
	Red			5,000
	Green			56000
Nepal Paints	Green	55,800		
	Yellow			66,000
	White			2,800
Reliance Paints	Blue	4,000		4,400
	White			2,500
	Yellow			37,000
Rukmani Chemical Industry	Blue	2,300		
	Yellow			95,000
	White			93
Yeti Paints	Red	2,600		
	Black			32

Note: Recently Kansai Nerolac India and Kansai Nepal (Nerolac) Paints merged so are placed in same column in above table.

7. Discussion and Recommendations

This is the third time Centre of Public Health and Environmental Development (CEPHED) has coordinated studies in Nepal where paints were analyzed to determine their lead content.

Comparison with previous studies

This study included more paints than the previous studies. Also current study included enamel paints only. As per current study, majority of enamel household paints available on the Nepalese market still contain high levels of lead (Table 1, appendix 2). The details of the three studies provide some encouraging developments.

Paint samples from two manufacturers included in all three studies (Asian Paints and Berger Jenson & Nicholson) contained high levels of lead (>600 ppm) in the studies in 2010 and 2011, but had reduced the lead content to below 90 ppm in all the paints sampled in the 2013 study. In addition, the increasing percentage of paints with lead levels below 90 ppm for the brands included in previous studies is a positive trend. However, samples from four brands included both in the 2011 and the current study (Pashupati Paints, Nepal Paints, Reliance Paints and Rukmani Chemical Industry) still contain high levels of lead (Table 2). This suggests that some paint manufacturers will not, on a voluntary basis, remove lead from their paints, and that enforced legislation is required.

Labeling

There seems to be a positive development in Nepal when it comes to public awareness of the hazards of lead in paint, since 12 paint sample among 49 paints were advertised and labeled as "No Added Lead". However there is not any monitoring mechanism being developed or any government authorities to inspect the validity of claim. The results from the paint analyses did not contradict these claims. However, it is preferable that the validity of such claims be backed-up by a third party certification.

Ten brands have the Nepal Standard mark, but it is clear from this study that this label does not ensure low lead levels. The criteria for using this mark needs to be expanded to include "unleaded."

Availability of paints with low lead content

Looking at the minimum lead concentrations found for each paint color, it is clear that any color can be purchased with a low lead content in Nepal. Unfortunately, the main suppliers of paints with low lead content are the multinational or international companies. A few paints from Nepalese manufacturers contained low lead levels, but only for black and white paints and not for bright colors. It is clear that the national paint industry must be supported financially and technically to switch to lead-free paint production in order to be able to compete with the multinational companies.

Recommendations:

The high prevalence of paints with a high lead content on the Nepalese market is a severe threat both for the health of the Nepali children and environment. It is clearly required that the government enacts a standard and a policy for the compulsory import, production, sales distribution and use of of non-leaded paints.

Recently, a few paint companies have started to produce lead free paints. However, this is only a voluntary initiative and unless a limit of lead in household paints becomes mandatory, consumers cannot be assured just by a claim from manufacturer. The recent movement from governmental

agencies on this issue provides a ray of hope, and we hope to have a mandatory standard in place soon.

CEPHED recommends:

CEPHED based on this current study and active engagement and dialogue with all concerned organization wish to make following recommendations.

1. **At the National Level (the government)**

a. Ministry of Science, Technology and Environment (MOSTE):

- Prepare a regulatory framework for lead levels in household paints (standard, act, label, GHS, no added leaded paints, regional standard harmonization).
- Conduct regular monitoring and analysis of paint products.
- Require proper labeling of paints including lead content, list of other compounds, date of manufacture and date of expiry.
- Require labeling to alert users to the hazards of lead-contaminated dust and other materials when previously painted surfaces are scraped or sanded in preparation for repainting.
- Initiate a third party certification process to ensure that statements of lead-free paints are valid.
- Disseminate information about childhood lead poisoning in communities to make everyone aware about lead poisoning, lead content in paints, and its consequences for human health as well as the environment.

b. Ministry of Education (MOE)/Department of Education (DOE)

- Establish programs at the district level in order to raise awareness among school children throughout the country.
- Coordinate with the Ministry of Education, Department of Education (DoE) to include lead toxicity appropriately and timely manners in school / college level curricula.
- Declare schools, playgrounds, day-care centers and health care facilities as lead free zones.
- Adopt a Green and Environment Friendly Public Purchase policy of unleaded paints.

c. Nepal Bureau of Standard and Metrology (NBSM), Ministry of Industry

- Fix a lead limit less than 90 ppm as one of the mandatory criteria to award Nepal Standard for any paints products.
- Establish clear policies in order to limit lead content during manufacturing when awarding the NS standard.
- Provide technical assistance to small and medium-sized paint manufacturers in order to provide laboratory set up for product analyses.

2. At the consumers level (to consumers):

- Ask for paints with no added lead whenever paint is purchased and purchase only low lead products already on the market.
- Check labeling on paint products when purchasing paint to ensure that they are low lead paints.
- Keep all the receipt of paint purchased in order to realize the compensation if something goes wrong from the use of such paints.

3. At scientific, private school, environmental and health associations level:

- Conduct research on lead in paints and disseminate the results
- Educate members/students about non-added lead paints and include the issue on school level course syllabus.
- Establish programs to regularly check children's blood lead levels.
- Educate doctors and other health professionals about lead poisoning and ways to minimize exposure from surfaces previously coated with lead paints.

4. Recommendations to paint manufacturers, vendors, large purchasers, etc.

- Shift from leaded to non-leaded paint production.
- Provide technical support to small scale manufacturers to remove lead from their paint production
- Demand lead-free paint products from the paint manufacturers.
- Provide training on ways to minimize exposure when re-painting and other work involving surfaces previously painted with leaded paints.

8. Appendixes

Appendix 1: Details of Enamel Decorative Paints Purchased in Nepalese Market and Analyzed for Lead Content

Sample Number	Brand Name	Color of Paint	Paint Can Size	Manufacture Date	Batch Number	Date of Purchase	Website on Label
NPL-100	Malhalaxmi Pulverising Udyog	White	500mL	May-10	690141	2nd Oct 2012	Not Mentioned
NPL-101	Nepal Shalimar paints	White	100mL	Apr-12	690101	4th Oct 2012	Not Mentioned
NPL-102	Nepal Shalimar paints	Yellow	100mL	Aug-11	80501	4th Oct 2012	Not Mentioned
NPL-103	Nepal Paints	Yellow	1L	Jul-12	7085	2nd Oct 2012	Not Mentioned
NPL-104	Apollo Paints	Yellow	500mL	May-12	3028	4th Oct 2012	Not Mentioned
NPL-105	Apollo Paints	White	200mL	Oct. 2010	2213	4th Oct 2012	Not Mentioned
NPL-106	Reliance Paints	White	100mL	Sep-11	05/363	4th Oct 2012	Not Mentioned
NPL-107	Micolite	White	50mL	NA	NA	4th Oct 2012	Not Mentioned
NPL-108	ICI Dulux	White	500mL	Jan-10	Q07004039	4th Oct 2012	Not Mentioned
NPL-109	Asian Paints	White	500mL	Sep-12	30269	4th Oct 2012	www.asianpaints.com
NPL-110	Kansai Nerolac Paints	White	500mL	Jul-11	JZ	4th Oct 2012	Not Mentioned
NPL-111	RCI Nerolac	Yellow	200mL	Apr-05	01799	10th Oct 2012	Not Mentioned
NPL-112	RCI Nerolac	Ultra white	100mL	Mar-10	1760	10th Oct 2012	Not Mentioned

NPL-113	Pashupati Paints Nepolite	Yellow	100mL	Apr-11	D04611	10th Oct 2012	Not Mentioned
NPL-114	Pashupati Paints Nepolite	White	500mL	Aug-11	H01411	10th Oct 2012	Not Mentioned
NPL-115	Baba Paints	Black	50mL	Mar-10	202J	29th Jan 2013	Not Mentioned
NPL-116	Baba Paints	Blue	100mL	Apr.	233K	29th Jan 2013	Not Mentioned
NPL-117	Baba Paints	Red	50mL.	NA	NA	29th Jan 2013	Not Mentioned
NPL-118	Baba Paints	Green	50mL	NA	M50	29th Jan 2013	Not Mentioned
NPL-119	Modi Paint and Varnish Works	Green	50mL.	Aug-98	10B08	29th Jan 2013	Not Mentioned
NPL-120	Modi Paint and Varnish Works	Yellow	50mL	NA	G94	29th Jan 2013	Not Mentioned
NPL-121	Pashupati paints, Nepolite	Red	50mL	Dec-09	L02209	29th Jan 2013	Not Mentioned
NPL-122	Pashupati Paints, Nepolite	Green	50mL.	Mar-10	1210	29th Jan 2013	Not Mentioned
NPL-123	Ratee Paints Udhyog Pvt. Ltd.	Red	100mL	Feb-11	NA	29th Jan 2013	Not Mentioned
NPL-124	Ratee Paints Udhyog Pvt. Ltd.	White	100mL	Jan-11	NA	29th Jan 2013	Not Mentioned
NPL-125	Ratee Paints Udhyog Pvt. Ltd.	Black	100mL.	Apr-12	NA	29th Jan 2013	Not Mentioned

NPL-126	Ratee Paints Udhyog Pvt. Ltd.	Blue	100mL.	Jan-11	NA	29th Jan 2013	Not Mentioned
NPL-127	Kansai Nepal (Nerolac)	White	500mL	Feb-13	690801	17th March 2013	Not Mentioned
NPL-128	Kansai Nepal (Nerolac)	Brown	500mL	Dec-12	690701	17th March 2013	Not Mentioned
NPL-129	Kansai Nepal (Nerolac)	Black	500mL	Feb-13	690901	17th March 2013	Not Mentioned
NPL-130	Berger Jenson & Nicolson	White	200mL	May-11	H1275	17th March 2013	Not Mentioned
NPL-131	G7 Industries	White	500mL	Nov-12	0690801	21st March 2013	Not Mentioned
NPL-132	G7 Industries	Green	50mL	NA	NA	21st March 2013	Not Mentioned
NPL-133	Dalmia Paints and Chemical Industries	White	100mL	NA	1023	21st March 2013	Not Mentioned
NPL-134	Dalmia Paints and Chemical Industries	Green	500mL	NA	NA	21st March 2013	Not Mentioned
NPL-135	Tirupati Balaji Paints and Chemicals	White	200mL	NA	NA	21st March 2013	Not Mentioned
NPL-136	Tirupati Balaji Paints and Chemicals	Yellow	200mL	NA	NA	21st March 2013	Not Mentioned
NPL-137	Krish Paints	White	100mL	NA	NA	21st March 2013	Not Mentioned
NPL-138	Three Rifle	Blue	100mL	NA	NA	21st March 2013	Not Mentioned
NPL-140	Asian Paints	Red	100mL	Oct-12	30386	21st March 2013	www.asianpaints.com

NPL-141	Asian Paints	Yellow	100mL	Sept. 2012	29485	27th March 2013	www.asianpaints.com
NPL-142	Asian Paints	Green	100mL	Jul-11	22647	27th March 2013	www.asianpaints.com
NPL-143	Reliance Paints	Blue	100mL	Nov-12	7/458	27th March 2013	Not Mentioned
NPL-144	Yeti Paints	Black	500mL	Mar. 2013	28132	27th March 2013	Not Mentioned
NPL-145	Berger Jenson and Nicholson	Yellow	500mL	Feb. 2013	B0924	17th March 2013	Not Mentioned
NPL-146	Baba Paints	White	100mL	Sept. 2012	53/2	27th March 2013	Not Mentioned
NPL-148	Reliance Paints	Yellow	100mL	Mar. 2012	11/399	27th March 2013	Not Mentioned
NPL-149	Nepal Paints	White	500mL	Jan-13	NA	27th March 2013	Not Mentioned
NPL-153	Asian Paints	Blue	100mL	Nov-11	25809	17th March 2013	www.asianpaints.com

Appendix 2 .Results of Paint Analysis and Purchase Information for New Enamel Decorative Paints Purchased in Nepal

Sample Number	Brand Name	Color of Paint	Parts Per Million Lead (dry weight)	Brand Head-quarters[1]	Country Where Manufactured[1]	Is there information on can about lead content of paint?	Nepal Standard (NS) mark
NPL-100	Malhalaxmi Pulverising Udyog	White	19	Nepal	Nepal	No	No
NPL-101	Nepal Shalimar paints	White	2,900	Nepal	Nepal	No	Yes
NPL-102	Nepal Shalimar paints	Yellow	33,000	Nepal	Nepal	No	Yes
NPL-103	Nepal Paints	Yellow	66,000	Nepal	Nepal	No	Yes
NPL-104	Apollo Paints	Yellow	64,000	Nepal	Nepal	No	Yes
NPL-105	Apollo Paints	White	1,630	Nepal	Nepal	No	No
NPL-106	Reliance Paints	White	2,500	Nepal	Nepal	No	Yes
NPL-107	Micolite	White	3,200	India	India	No	No
NPL-108	ICI Dulux	White	30	United Kingdom	India	Yes, No added Pb, Hg, Cr	No
NPL-109	Asian Paints	White	25	India	Nepal	Yes, No added Pb,Hg, As & Cr	Yes
NPL-110	Kansai Paints Nerolac	White	38	Japan	India	Yes, No added Pb,Hg, As & Cr	No
NPL-111	RCI Nerolac	Yellow	95,000	Nepal	Nepal	No	No
NPL-112	RCI Nerolac	White	93	Nepal	Nepal	No	No
NPL-113	Pashupati Paints Nepolite	Yellow	130,000	Nepal	Nepal	No	Yes
NPL-114	Pashupati Paints Nepolite	White	169	Nepal	Nepal	No	Yes
NPL-115	Baba Paints	Black	6,700	Nepal	Nepal	No	No
NPL-116	Baba Paints	Blue	6,200	Nepal	Nepal	No	Yes
NPL-117	Baba Paints	Red	6,700	Nepal	Nepal	No	No
NPL-118	Baba Paints	Green	69,000	Nepal	Nepal	No	No

NPL-119	Modi Paint and Varnish Works	Green	27,000	India	India	No	No
NPL-120	Modi Paint and Varnish Works	Yellow	55,000	India	India	No	No
NPL-121	Pashupati Paints, Nepolite	Red	5,000	Nepal	Nepal	No	Yes
NPL-122	Pashupati Paints, Nepolite	Green	56,000	Nepal	Nepal	No	Yes
NPL-123	Ratee Paints Udhyog Pvt. Ltd.	Red	30000	Nepal	Nepal	No	No
NPL-124	Ratee Paints Udhyog Pvt. Ltd.	White	3,000	Nepal	Nepal	No	No
NPL-125	Ratee Paints Udhyog Pvt. Ltd.	Black	1,540	Nepal	Nepal	No	No
NPL-126	Ratee Paints Udhyog Pvt. Ltd.	Blue	1,490	Nepal	Nepal	No	No
NPL-127	Kansai Nepal (Nerolac)	White	12	Japan	Nepal	Yes, No added Pb, Hg, Cr, Ar and Antinomy	No
NPL-128	Kansai Nepal (Nerolac)	Brown	39	Japan	Nepal	Yes, No added Pb, Hg, Cr, Ar and Antinomy	No
NPL-129	Kansai Nepal (Nerolac)	Black	108	Japan	Nepal	Yes, No added Pb, Hg, Cr, Ar and Antinomy	No
NPL-130	Berger Jenson & Nicolson	White	11	India	Nepal	Yes, No added Pb, Hg and Cr.	Yes
NPL-131	G7 Industries	White	2,400	Nepal	Nepal	No	No
NPL-132	G7 Industries	Green	37,000	Nepal	Nepal	No	No
NPL-133	Dalmia Paints and Chemical Industries	White	1,540	Nepal	Nepal	No	No
NPL-134	Dalmia Paints and Chemical Industries	Green	32,000	Nepal	Nepal	No	No
NPL-135	Tirupati Balaji Paints and Chemicals	White	42	Nepal	Nepal	No	No
NPL-136	Tirupati Balaji Paints and Chemicals	Yellow	22,000	Nepal	Nepal	No	No
NPL-137	Krish Paints	White	900	Nepal	Nepal	No	No
NPL-138	Three Rifle	Blue	1,250	India	India	No	No
NPL-140	Asian Paints	Red	53	India	Nepal	Yes, No added Pb, Hg and Cr.	Yes

NPL-141	Asian Paints	Yellow	< 9	India	Nepal	Yes, No added Pb, Hg and Cr.	Yes
NPL-142	Asian Paints	Green	58	India	Nepal	Yes, No added Pb, Hg and Cr.	Yes
NPL-143	Reliance Paints	Blue	4,400	Nepal	Nepal	No	Yes
NPL-144	Yeti Paints	Black	32	Nepal	Nepal	No	No
NPL-145	Berger Jenson and Nicholson	Yellow	13	India	Nepal	Yes, No added Pb, Hg and Cr.	Yes
NPL-146	Baba Paints	White	6,100	Nepal	Nepal	No	Yes
NPL-148	Reliance Paints	Yellow	37,000	Nepal	Nepal	No	No
NPL-149	Nepal Paints	White	2,800	Nepal	Nepal	No	Yes
NPL-153	Asian Paints	Blue	18	India	Nepal	Yes, No added Pb, Hg and Cr.	Yes

[1] Information on *Country of Brand Headquarters* and *Country Where Manufactured* is provided, but in some cases, the information could not be verified.

Appendix 3. Lead Concentration (ppm) by Color of New Enamel Decorative Paints Purchased in Nepal

Color	Number of Samples	Average lead concentration ppm	Number of Samples Above 90 ppm lead	Number of Samples Above 600 ppm lead	Number of Samples Above 10,000 ppm lead	Maximum ppm	Minimum ppm
White	19	1,400	12	10	0	6,100	11
Red	4	10,400	3	3	1	30,000	53
Black	4	2,100	3	2	0	6,700	32
Blue	5	2,700	4	4	0	6,200	18
Green	6	36,800	5	5	5	69,000	58
Brown	1	39	0	0	0	39	
Yellow	10	50,200	8	8	8	130,000	9