

## 炸弹、树木和黄金： 老挝战后景观重建中采矿与排雷的同化过程

### Bombs, Wood and Gold: Synchronizing the Processes of Mining and Demining in the Post-war Landscape of Laos

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摘要 ……

该项目提出要在资源开采与战后金属循环经济之间建立新的联系，通过重建因战争而伤痕累累的景观，进而改善民生。这是一种“以开采金矿进行排弹”的战略。仍残留着越南战争留下的8 000万余枚炸弹的老挝战后景观，成为重新思索采矿过程的契机；同时，矿藏勘探和采挖过程也将成为复原和重建这片危险之地的重要机制。

关键词 ……

战后景观；战后金属循环；粮食生产；资源开采；森林砍伐

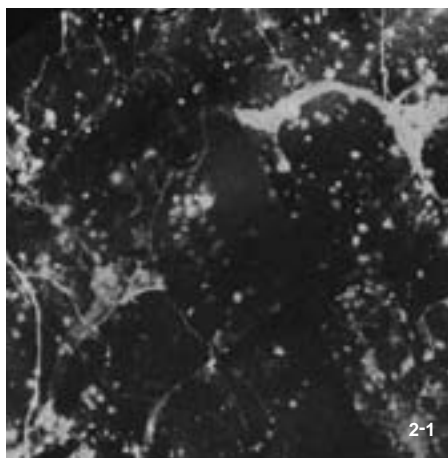
Abstract ...

The project poses a new linkage between resource extraction and post-war metal cycling economies, strengthening a livelihood that heals a war-scarred landscape. It proposes a strategy of "demining bombs by mining gold". The bomb-soaked landscape of Laos, which has 80 million unexploded bombs left over from the Vietnam War, provides an opportunity to rethink the processes of mining. Simultaneously, mineral exploration and excavation processes become mechanisms of rehabilitating and reconstructing the hazardous ground.

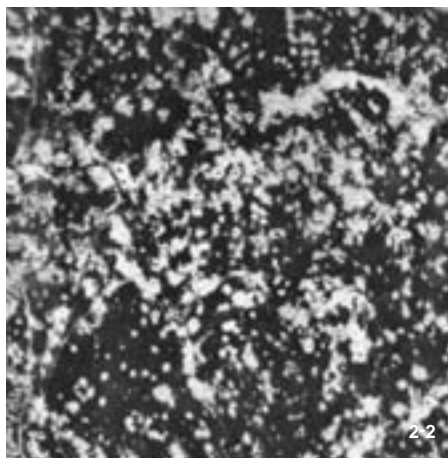
Key words ...

Post-war Landscape; Post-war Metal Cycling; Food Production; Resource Extraction; Deforestation





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### 挑战与机遇

老挝是世界上遭受炸弹袭击最严重的国家，这一状况在越南战争结束后已经延续了整整两代人。战争中，美国战斗机向这个紧邻越南的内陆国家投掷了2.7亿枚炸弹。除了对胡志明小道进行持续的、目的性的轰炸之外，美军还将返回越南空军基地之前剩余的炸弹全部投掷在了老挝。今天，老挝仍然被这一残酷的事实所笼罩：大约有1/3的炸弹从未被引爆（信息来源：老挝国家排除未爆炸弹方案中心）。按照目前的排雷速度，清除所有炸弹至少还需要3 600年<sup>①</sup>。命运弄人，这块土地同时也是世界上人均黄金矿石储量最丰富的地区（信息来源：老挝共和国矿产部）。当无数人道主义团体仍在努力重建这片被战争践踏过的土地时，老挝的景观又面临着一个新的困境。这一次，威胁来自于国际金矿开采公司。

### 灵感来源

我之所以选择这一题目，是受到源

于越南战争的独特景观现象的启发。我曾偶然读到托马斯·J·坎帕内拉的一篇文章为《弹坑鱼池》的文章<sup>②</sup>。他在文章中写道：“关于越战最大的讽刺之一，就是美国B-52轰炸机留下的弹坑现在竟然成为越南人民赖以生存的食物来源之地。”据统计，在9年的时间内，美国对老挝进行的空袭使得约3.8亿立方米的土壤被炸飞或移位（信息来源：老挝国家排除未爆炸弹方案中心）。而在过去的40年里，这些弹坑已经从一种摧毁人们生活与谋生方式的可怕的战争痕迹，变成了越南、柬埔寨以及老挝人民获得食物的来源。这些遗迹悄然融入到农业景观中，从死亡的象征转变为生命的象征；从悲剧的象征变为了谋生的象征。

### 场地调研

越战是美国最具争议的历史事件之一，异于周围自然景观且无人问津的弹坑仍是这一时期留下的“纪念物”。这一历史的证物萦绕在我脑中，我决心亲身去感受

1. 老挝川圹炸弹现场的红外照片：轰炸结束的40年后，满山遍野的弹坑中生长着树木和灌木。
2. 该地区的高空图像展现了1967年所发生的B-52轰炸机大规模空袭前后的场景。较大的弹坑直径为6-12m（图片来源：美国空军）。
3. 老挝沙湾拿吉省道路施工的红外照片：新修建的10.9km长的道路作为一个采矿项目基础设施的一部分。金矿开采公司目前正准备通过使用原始的、粗犷的开采方式对土地进行再次开发，这被认为是造成老挝森林过度砍伐的一个主要因素。



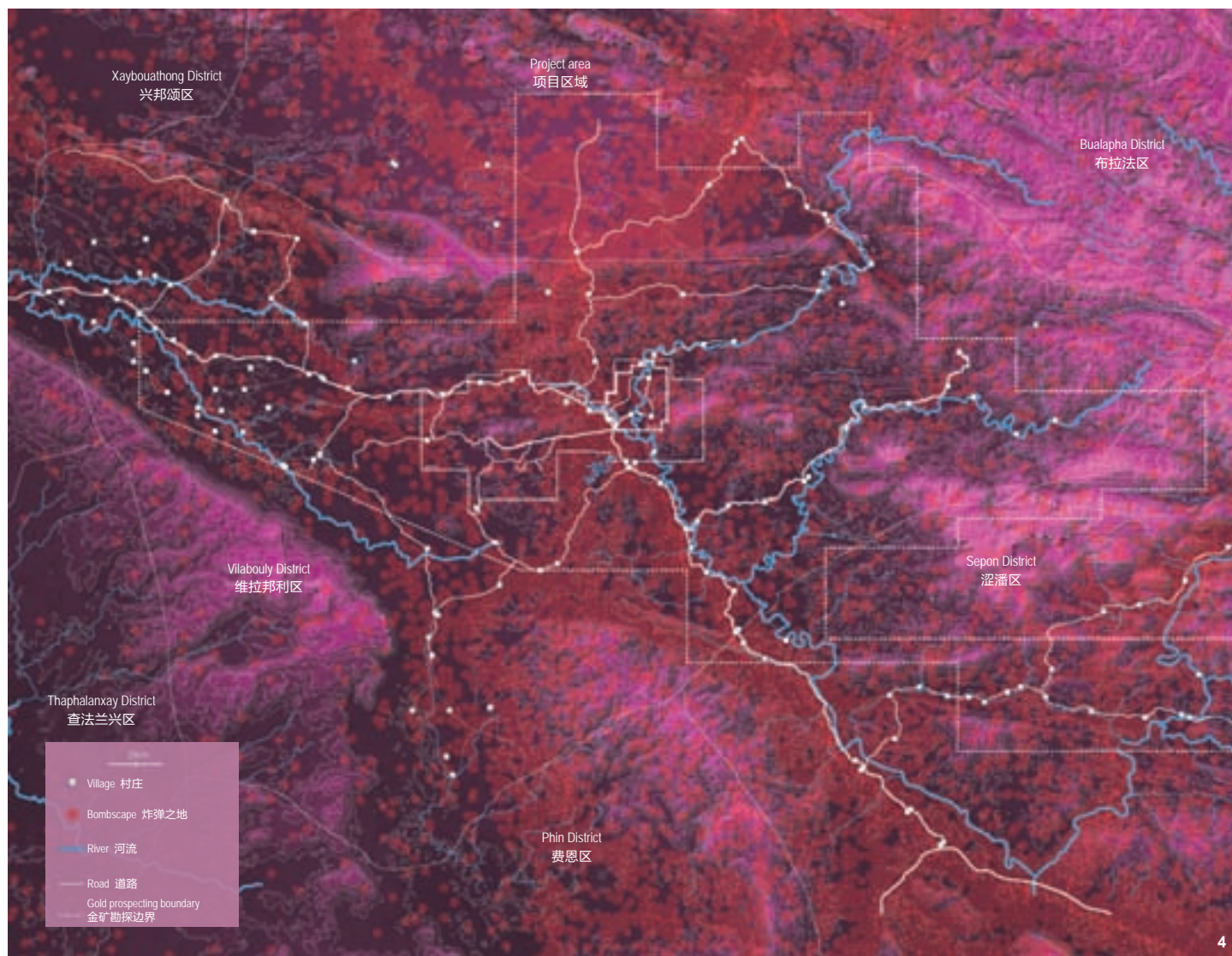
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受、发掘这片动荡的土地。我想去了解那些生存于此的人们的智慧——可以说，这是关乎生存的艺术。2012年1月，在哈佛大学设计学院佩妮·怀特项目基金的资助下，我前往老挝对战后景观开展了更为深入的调查研究。本次旅程的目的是希望和当地居民重新谈论这段创伤性的历史，并记录下这些受创景观目前的状况。在走访过程中，我使用了红外胶片进行拍摄：这是一种军用胶片，可以记录下不可见光谱范围中的红外线，使绿色的自然植被呈现为暗红或亮粉色。这些老挝弹坑场地的红外照片能够展示出景观中自然植被（粉色）与非植被（灰色）之间的界线（图3）。

在调研的过程中，我深切感受到这场战争与其说是打击敌人，倒不如说是对土地与当地生存环境的一种对抗。在实地调查中，有3个事物对我影响最大，并最终成为了设计方案的核心元素：炸弹、树木与黄金。我走访了老挝国家排除未爆炸弹方案中心——一家处理老挝战后遗存炸弹的官方机构。他们为我展示了一幅地图，上面显示的未引爆炸弹分布最密集的地区竟然包括沙湾拿吉省。这个发现令我感到非常震惊，因为据我所知这一地区是目前老挝境内开展黄金探矿的主要地区之一。如何在遍布炸弹之地进行探矿？通过调查，我发现沙湾拿吉省是老挝黄金储量最高的地区之一，因此很多国际探矿公司有

意对该地区的排弹项目进行投资，这样他们才能够安全地探矿。

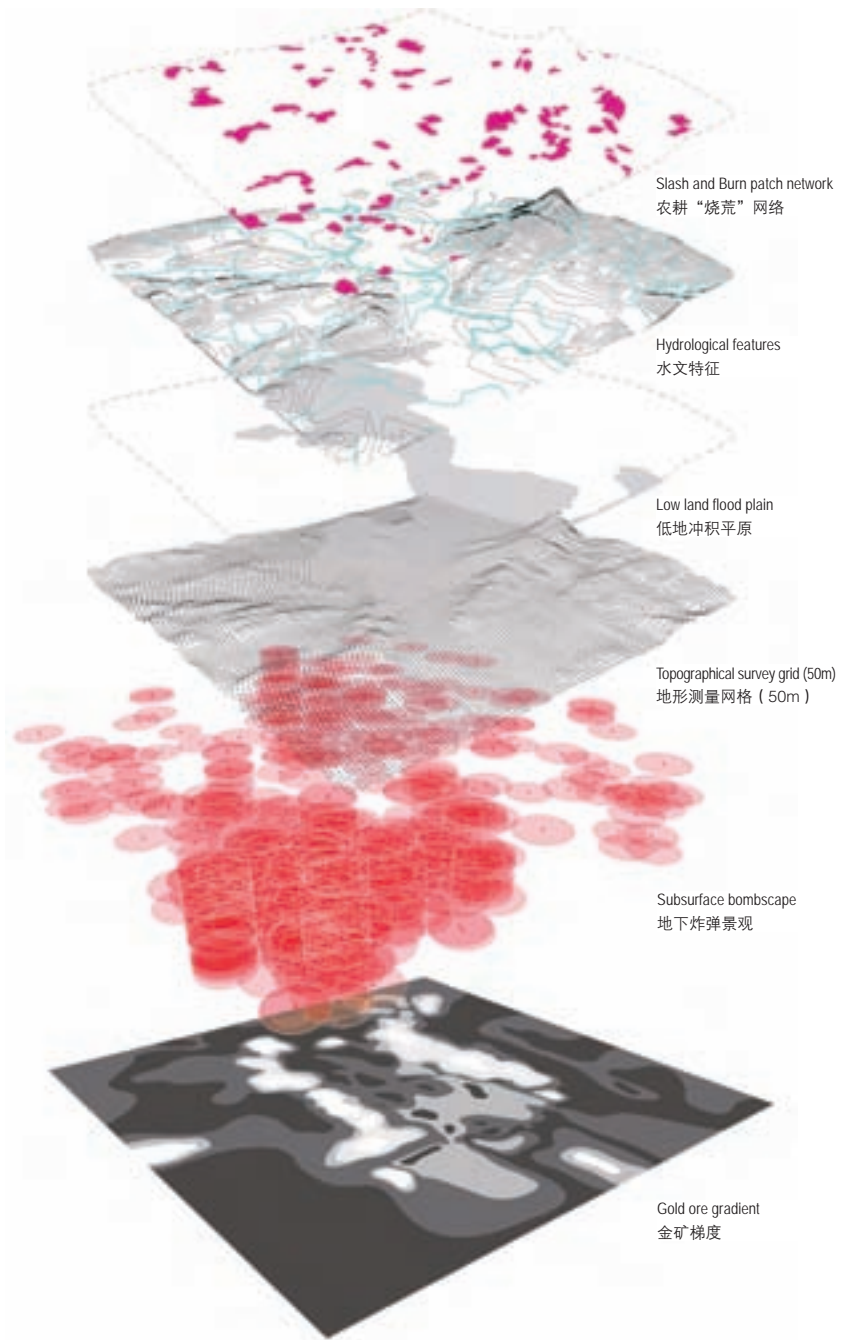
随后我探访了由国际人道组织MAG<sup>®</sup>负责的位于川圹省的排弹区。MAG提到，炸弹越大，往往隐藏得越深。但是，我发现他们进行的只是浅层地表排查。虽然从地表到地下15m处都可能存在未引爆的炸弹，但是由于炸弹的清理工作非常耗时并且费用高昂，老挝排弹条例中规定的农业用地排查深度仅为25cm——即地表耕种的最深深度。场地调查还揭露出另一个残酷的事实：由于农业生产能力不足，很多老挝人将“猎取炸弹”作为一种谋生的手段。人们四处寻找并挖掘未引爆的炸弹，将弹壳作为废金属卖给回收站。这是造成



现今老挝炸弹伤亡事故的最主要原因，而且在事故死亡人员中近一半是儿童<sup>④</sup>。在此之前，我从未见过一个受炸弹的影响如此深重的社会，这使我开始思考是否能够重新引导老挝的战后弹药金属循环过程，是否能够建立一种能让这片遍布炸弹的土地得到深层、细致的排查的机制。在此背景下，将采矿与排弹机制联系在一起便成为本方案的初始构想。

越南战争期间，2.7亿枚炸弹蹂躏了老挝的土地。现在，国际金矿开采公司从容地进驻老挝，并用野蛮的、无所不用其极的矿产开采方式再次践踏这片土地。忌惮于老挝土地中遍布的未引爆炸弹，国际采矿公司直到最近几年才开始在老挝进行

4. 场地平面：分析测绘炸弹之地。该场地位于胡志明小道的起点，曾在越南战争中遭受过最严重的轰炸。该场地还是老挝最大的金矿之一。图中显示出炸弹之地与金矿勘探的边界。
5. 整合战后景观元素：炸弹、木材和黄金是战后景观的三大元素。它们目前彼此独立。通过整合排雷、农耕“烧荒”，以及采矿过程，这些看似无关的元素被战略性地联系起来并形成一种同步互利机制。
6. 采矿和植被清除
  - 6-1. 2008年老挝沙湾拿吉省矿产勘探和开采图。
  - 6-2. 2010年老挝沙湾拿吉省矿产勘探和开采图。
4. Site plan: Mapping bombscape. The site is at the head of Ho Chi Minh trail, an area that was most heavily bombed during the Vietnam War. It overlaps with one of the largest gold prospecting districts in Laos. Map shows the bombscape with the gold prospecting boundary.
5. Synchronizing a war-scarred landscape: Bombs, wood and gold are three major elements on this war-scarred landscape. They are currently being viewed as independent of one another. By synchronizing processes of demining, slash and burn, and mining, these seemingly unrelated layers are strategically connected and benefit each other.
6. Mining and devegetation
  - 6-1. Mineral exploration and extraction, Savannakhet Province, Laos, 2008.
  - 6-2. Mineral exploration and extraction, Savannakhet Province, Laos, 2010.



矿产的勘探、开发与开采<sup>⑤</sup>。新兴的对老挝丰富的地下矿产资源的兴趣、逐步扩大的排弹项目与传统的农耕“烧荒”一起，被看作是造成老挝森林植被破坏的主要因素<sup>⑥</sup>。这3个看似毫不相关的过程，都需要清除地表植被以进行后续的相关操作。在场地上亲眼目睹战争留下的巨大而深远的影响，推动着我重新思考采矿与排弹这两种对景观造成极大影响的人工干预方式。我们能否在两者之间建立一种同步互利机制，从而使得这两种破坏性行为能够相互抵消？

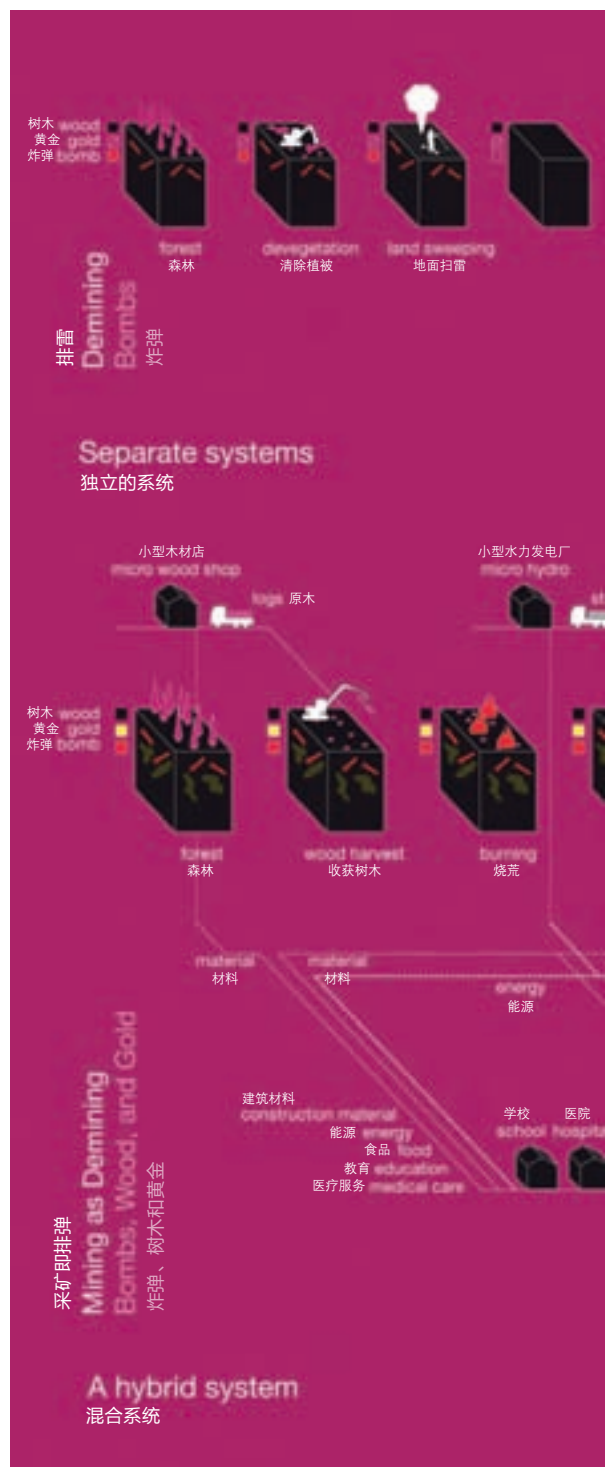
### 新的系统

结合实地考察信息和返回美国进行的后续研究，我开始意识到老挝的粮食生产、能源生产、资源开采以及战后遗存金属回收交易之间具有不可分割的关联性。曾经被认为是死亡象征的弹坑悄然转变为“鱼塘”，成为生存的象征；同样地，名为“采矿即排弹”的策略也将象征“破坏”的采矿项目，转变为老挝战后景观重建良性循环系统的环节之一，能够修复土地并改善民生。采矿将成为排弹的动力，因为黄金能够用来支付高昂的排弹费用；采矿公司同时担任景观设计师的角色——修复遍布炸弹的土地，使其转变为支持当地居民生计的丰产之地。

遍布炸弹的景观由此成为重新思考采矿过程的契机。与此同时，黄金的勘探和发掘过程成为对战后危险土地进行恢复和重建的有效机制。策略性地将未引爆炸弹的地理分散性与老挝至今沿用的周期性农耕“烧荒”过程相联系，“采矿即排弹”战略将呈现出一种在战后景观之上进行的小尺度、分散化的操作特点。由农耕“烧荒”<sup>⑦</sup>过程留下的位置呈周期性变化的无植被地块，将成为引导“新采矿”过程的时间及空间结构。通过将采矿及排弹过程融入农耕“烧荒”周期之中，可以形成土地使用的循环机制，从而将采矿、排弹及“烧荒”对景观造成的负面影响降至最低。采矿过程也将因此拥有多阶段的土地修复周期，使后采矿景观得到重生。

同作物的轮种模式类似，“采矿即排弹”战略创造了一个新的“收获”系统：粮食、炸弹和黄金将被循环收获。第一年，农耕“烧荒”将生产粮食并留下一块无植被地块；接下来，排弹部队将进行炸弹排测，“收获”炸弹并回收金属，同时为即将开始的矿藏勘探开辟一条“无弹”的安全通道；以“烧荒”地块为基本尺度的露天井坑是“收获”黄金的场地；随后这些坑洞可用于储藏临近采矿区的尾矿；采矿结束后，标高位于洪泛区内的矿坑将在复垦后转变为坑塘——同“弹坑鱼塘”的转变方式相似，矿坑将被用于新型的水产养殖；而标高高于洪泛区的矿坑则被改造为梯田进行复垦。采矿过程中，将策略性地使这些坑洞向阳坡面的面积最大化，或者在采矿操作结束后对其进行坡度再造。罂粟科植物作为曾经在老挝土地上蓬勃生长的主要作物，同其他农作物一起共同创造出老挝新的整治型区域经济。

“采矿即排弹”将金矿开采看作老挝发展循环经济的契机。如果说，越战中肆虐的炸弹投掷是为了破坏区域基础设施，“采矿即排弹”模式则成为重建区域基础设施的起点和改善战后百姓生计的基础。建造诸如道路、能源站、水利大坝之类的基础设施是矿产开采的必备条件，它们为区域交通物流提供了便利，创造出采矿所需的能源。其他市政建设，诸如医院和学校也是矿区规划的必备配套设施。“采矿即排弹”的小规模、多周期开采机制将配套轻型且分布广泛的基础设施。这不同于传统采矿方式采用的大型矿坑开采及配套建设的重型基础设施，从而能够减小对环境的影响。此外，小型工业也伴随炸弹及金矿的“收获”过程而涌现，回收并重新组织和引导战后景观中的物质流动路径：炸弹将获得“重生”，它们将被专业排弹部队收集，弹壳金属被送往当地新建的小型工厂，熔炼为钢筋后成为当地小型水坝或桥梁的建筑材料。黄金不但提供排弹所需的资金，同时将被用于本地的宗教和文化重建，成为记录“采矿即排弹”过程的景观标记。



“采矿即排弹”策略将金矿开采公司看作“景观设计师”。采矿的过程和作用被重新思考：它们不再是粗放地造成环境破坏的罪魁祸首，而是排弹的工具和契机。采矿的操作成为“挖掘与重建”并存的机制：采矿过程中的副产品，如矿坑和矿渣，将被再利用并创造重塑战后景观的



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机遇。此外，原本需要3 600年才能完成的排弹过程将被重新规划。废土及矿渣将用于建造隔离带：通过对美军在老挝投弹的历史数据进行分析，极度危险的弹区将被标注为“高危”地段，被隔离带包围。具有讽刺意味的是，在被描述为抢夺资源的“新殖民时代”，在国际采矿集团进驻老

挝并造成一系列环境问题的情况下，这些炸弹密集的高危地区形成了散布在老挝境内的“不可触碰之地”。它们将以“生物保护区”的形式标记下曾经发生在这片土地上的战争之殇（图7）。

该策略提出，在老挝的资源开采与战后金属循环经济之间建立新的联系，通

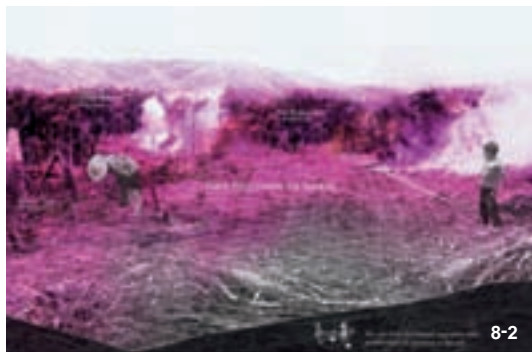
7. 金矿开采促进新区域经济的萌发。图中显示出金矿开采成为了这一深受战争创伤的景观重新利用和重新安排材料流向的机遇：微型产业随着炸弹与金矿的挖掘而产生。
7. Gold Mining as Incubator for New Regional Economy. Mining as Demining views gold mining as an opportunity to recycle and redirect material flows on this war-scarred landscape; micro-industries emerge together with bomb and gold harvest.



8-1



9-1



8-2



9-2



8-3



9-3

## 8. 战后景观的转变

8-1. 1964~1973年间, 老挝失去了1/5的森林。

8-2. 播种土地准备: 农耕“烧荒”创造了可供1年消耗的食物, 并提供了清除干净的地面。

8-3. 后采矿景观——黄金作为记录过程的标记: 黄金不但能够提供排弹所需的资金, 或被国际公司出口, 同时还将被用于本地的宗教和文化重建, 成为记录“采矿即排弹”过程的景观标记。

## 9. 战后景观的转变

9-1. 1964~1973年间, 空袭导致大约1/3的老挝人口死亡、受伤或无家可归。

9-2. 收集炸弹: 贫困促使当地人寻找未爆炸的炸弹以获得废铁: 这是一项高度危险的活动, 也是造成目前炸弹伤亡的最主要原因。

9-3. 炸弹的新来世: 微型工业伴随着炸弹和黄金收获出现。

## 8. Transforming ground

8-1. From 1964 to 1973, Laos lost 1/5 of the total forest area.

8-2. Patch preparation for seeding: Slash and burn creates food for 1 year and provides a cleared ground cover.

8-3. Post mined scape-gold as registration of processes: Gold will be used to not only pay for demining, or be exported by international companies, but also will be used locally for religious and cultural purposes, becoming a registration of the mining and demining processes.

## 9. Transforming ground.

9-1. From 1964 to 1973, around a third of the population of Laos was killed, injured or made homeless by the air war.

9-2. Bomb harvest: The poverty has driven the locals to hunt for unexploded bombs to harvest scrap metal: a highly dangerous activity that is the main cause of bomb casualties today.

9-3. Bombs' new afterlife: Micro-industries emerge together with the bomb and gold harvest.

过重建因战争而伤痕累累的景观, 进而改善民生。战后景观的重建将伴随着新系统中材料的回收与再利用: 炸弹获得“新生”, 渣土被重新利用, 新经济和新型工业随着变化、移动的景观而焕发生机, 安全的“乐土”被逐渐带回曾经满目疮痍的战争之地。采矿与排弹的并行过程将曾经是破坏性的操作, 转变为构建丰饶、安全的景观的契机。LAF

## 注释

- ① 联合国开发计划署专家、老挝共和国国家监管局国家未引爆炸弹项目高级技术顾问蒂姆·霍纳在2007年的演讲中提到, 以老挝目前的清理速度, 还需要3 600年才能完成对仍残留在老挝共和国境内的炸药的清理。详见2007年蒂姆·霍纳在日内瓦“常规武器公约政府专家会议”中的讲话。
- ② 托马斯·J·坎帕内拉指出在稻田被未引爆的炸弹占据而无法耕作的情况下, 散布在稻田中的弹坑巧妙地成为当地人进行农业生产的替代品。他讲述了在老挝的邻国越南, 弹坑被用于渔业养殖。详见托马斯·J·坎帕内拉的《弹坑鱼塘》,《场所》杂志,第9卷第3期,第48页(剑桥: MIT出版社, 1995年)。
- ③ 排雷咨询组织(MAG)是一个通过销毁地雷、未引爆炸弹及其他冲突后的残留武器, 以拯救生命并构建未来的国际组织。从1989年开始, MAG已经在超过35个国家中开展救援工作, 并于1997年成为诺贝尔和平奖的联合获奖人。
- ④ 《收获炸弹》是一部由基姆·默多恩特在2007年执导的纪录片。该片展现了战争给老挝带来的一系列影响: 未引爆的炸弹继续杀死并伤害着人们, 阻碍人们进行包括粮食生产在内的土地利用。讽刺的是, 这些炸弹促成了当地人新的创收方式: 炸弹被作为废弃金属, 成为老挝的“新经济作物”。

- ⑤ 根据《老挝年度矿业报告》(老挝共和国矿产部), 老挝共有572座已经进行开采和勘探的矿床, 其中47%含有金、铜、铅和(或)锌矿。根据2008年10月的数据, 共有127家本土及国外公司参与到老挝的矿藏勘探、开采及可行性研究中(共计213个项目)。其中, 42家公司为本土投资者, 85家外国投资者中包括中国、越南、泰国、澳大利亚、俄罗斯、韩国、朝鲜、加拿大、英国及波兰。详见老挝共和国矿产部《2008年度矿业报告》。
- ⑥ 弥生藤田·拉格维斯就老挝土地变化的历史进行了简要回顾。在古代, 广泛的森林产品贸易对老挝具有重要意义。内战时期, 猛烈的轰炸和破坏导致大批郊区居民从东部迁移到西部, 造成了临时村庄的搭建、森林的过度砍伐、农耕“烧荒”的扩张以及随之形成的次生林。战后时期, 资源管理政策的缺乏导致老挝全境的森林退化。详见弥生藤田·拉格维斯的《理解老挝变化的历史: 进行发展的重要前提》,《山区研究与发展》杂志,第26卷第3期,第197-199页, 2006年。
- ⑦ “烧荒农业”是老挝一种传统的农耕方式, 包括在一个种植周期内不同地块间的多次轮作耕种。农民在一片土地上耕作一到两季, 然后转移到另一块已经休耕多年的土地上, 通过砍伐及焚烧来清除地块上的植被。

## Threats and Opportunities

Laos is the most bombed country, per capita, on the planet, a distinction it holds two full generations after the Vietnam War. At the time, American planes dropped 270 million bombs on the landlocked country bordering Vietnam, blanketing the Ho Chi Minh Trail and indiscriminately unloading ordnance that had not yet been dropped elsewhere. Today, life in Laos is still defined by this reality: nearly a third of those bombs never detonated. At the current clearance rate, it would take more than 3,600 years to clean up all the unexploded bombs<sup>①</sup>. By a twist of fate, this land also happens to contain the richest gold ore concentration in the world (Department of Mines, Lao PDR). As innumerable humanitarian groups continue working to rebuild places that were once trampled by war, the landscape now faces a new invasion: this time, from international gold-mining companies.

## Initial Inspiration

I was initially inspired by an odd legacy of the war in Laos. I came across an article by Thomas J. Campanella called “Bomb Crater Fish Ponds”<sup>②</sup>. He writes, “One of the great ironies of the Vietnam War is that the bomb craters left in the wake of American B-52s now provide sustenance to the Vietnamese people.” American bombs displaced 500 million cubic yards of earth in 9 years (UXO LAO). Over the last 40 years, B-52 bomb craters have been transformed from hideous manifestations of war, in which lives and livelihoods were destroyed, into sources of sustenance for the Vietnamese, Cambodian and Laotian people. Villagers have transformed the bomb craters into ponds for cultivating fish. These relics have become part of the agrarian landscape, transformed from a symbol of death into one of life: a symbol of tragedy into one of sustenance.

## Site Investigation

Untouched and unnatural, these ponds remain as under-discussed monuments from one of American history’s most controversial eras. This physical evidence of a history haunted me, and I resolved to discover more about this land in turmoil. I want to know more about the intelligence that the people living there have developed — it is about the art of survival. In January 2012, funded by Harvard GSD Penny White program, I travelled to Laos to further investigate its postwar landscape. My journey’s purpose was to reopen a dialogue with local villagers on this traumatic history and to document the scarred landscape in its current state. During my visit, I used infrared film: a type of military film which registers an invisible spectrum of infrared light, rendering the green landscape in vivid hues of crimson and hot pink. These infrared photographs of Laotian bomb sites show the difference between organic (pink) and non-organic (grey) material in the landscape (Fig. 3).

During my visit, I realized that it had been a war against the land as much as it was against armies. Among the numerous site investigations, three concepts impacted me the most and became the essential elements of my final design: bombs, wood and gold. I visited UXO LAO, the official organization that is dealing with the demining. They showed me a map of the most contaminated areas, which included the Province of Sanvannakhet. This surprised me, because I knew there was gold exploration going on in that area. So how is it possible to do mining there? As it turns out, some of the densest concentrations of gold ore are in that region, and the mining companies are willing to invest in clearing the area so they can mine safely.

Then I visited the demining site in Xieng Khouang Province, where the international humanitarian group MAG<sup>③</sup> operates. MAG

mentioned that the bigger the bombs, the deeper they burrow. However, I noticed that they were only clearing the topsoil layer. While the largest are sometimes found 15 meters below ground, the regulations specify that if the land is for agricultural use, only the top 25 centimeters need to be cleared — just enough to permit above-ground farming — since bomb clearance is extremely time and cost intensive. My site investigation also revealed the fact that, in the absence of agricultural production, many inhabitants of Laos have resorted to bomb harvesting as a means of survival. People hunt for unexploded bombs to harvest scrap metal: a highly dangerous activity, which is the main cause of bomb casualties today, while almost half of these deaths are children<sup>④</sup>. I have never seen a society that was so impregnated with ordnance. I thought that there should be a way to redirect the flow of these bombs in the post-war era, a method that can clear the land thoroughly, which inspired me to think of the gold-mining companies.

270 million bombs trampled the land during wartime. Gold companies are now poised to trample the land again by using raw, unmitigated methods of exploitation. Due to the fact that Laos’ landscape is so overwhelmingly saturated with unexploded ordnance, it was not until very recently that international mining companies began entering Laos to pursue mineral prospecting, exploration, and extraction<sup>⑤</sup>. This new interest in Laos’ underground riches, together with the expanding demining programs, as well as the local slash and burn agriculture are largely considered to be the major factors of deforestation in Laos<sup>⑥</sup>. Currently being viewed as independent of each other, all three require a clearing of ground vegetation in order for their operations to begin. The intensive and far-reaching effect of the war that I witnessed on site compelled me to



10. 战后景观的转变
- 10-1. 1964~1973年间, 每隔8分钟, 美国便在老挝投下一架飞机所装载的炸弹。
- 10-2. 收集炸弹/矿产勘探: 一个种植后的地块用作排雷。排雷部队将进行炸弹排查, “收获”炸弹并回收金属, 同时为即将开始的矿产勘探开辟一条“无弹”的安全通道。
- 10-3. 池塘都市主义: 采矿结束后, 标高位于洪泛区内的矿坑将在复垦后转变为坑塘。
11. 战后景观的转变
- 11-1. 1964~1973年间, 美国在老挝进行了超过58万次轰炸任务, 并造成了超过400万个弹坑。
- 11-2. 作为“景观设计师”的金矿开采公司: 微观尺度和多相位的采矿作业成为获得无炸弹土地的关键手段。
- 11-3. 罂粟科植物作为曾经在老挝土地上蓬勃生长的主要作物, 将同其他农作物一起共同创造老挝新的整治型区域经济。
10. Transforming ground
- 10-1. From 1964-1973, the US dropped a planeload of bombs on Laos every 8 minutes, day and night.
- 10-2. Bomb harvest / Gold exploration: A post cultivation patch is ready for demining. Demining team harvests bombs by sweeping the ground and creates a safe trail for gold exploration.
- 10-3. Pond urbanism: After remediation, post-mined pit is filled with water and used for aquaculture if it is within the flood plain.
11. Transforming ground
- 11-1. From 1964 ~ 1973, the US flew more than 580,000 bombing missions over Laos and created more than 4,000,000 craters.
- 11-2. Gold companies as landscape architects: The micro-scale and multi-phasing mining operations are the key devices to get the bomb-free land back.
- 11-3. Together with other crops, opium poppy, a major plant that thrives on the land of Laos, will be used to create a new remediative regional economy.

reimagine mining and demining, two highly destructive human interventions on the land. What if we deployed them in sync, leveraging one evil to right another?

### A New System

Through on-site investigation, combined with further research carried out upon returning to the U.S., I came to understand the inseparability of food production, energy production, resource extraction and a post war metal recovery and cycling economy in Laos. Bomb craters that were once symbols of death have been transformed into something quite the opposite. Similarly, I want to recast

minefields in a virtuous cycle that could sustain local communities while restoring the land, called “Mining as Demining”. Mining provides the impetus for demining, as gold will help pay for it all, and mining companies would be exploited as landscape architects to ultimately help turn mined land back over to productive use for local communities.

The bomb-laden landscape yields an opportunity to rethink the processes of mining. Simultaneously, gold exploration and excavation processes become mechanisms of rehabilitating and reconstructing the hazardous ground. By strategically using the dispersive locations of unexploded

bombs, coupled with the existing cycles of slash and burn cultivation<sup>⑦</sup>, “Mining as Demining” becomes characterized by a decentralized micro-scale operation. The migrating vegetation-cleared patches become the phasing structure of the mining process. Sharing the cycle of rotational cultivation practice, the operations take advantage of rotational land uses to minimize the operational footprint of mining. This enables more remediation phases, and also allows for the landscape to regenerate in its post-mined phase.

From this “crop” rotation, a new harvesting system emerges: food, bombs, and gold.

For the first year, slash and burn generates food and clears the ground cover. Next a demining team harvests bombs by sweeping the ground, creating a safe trail for gold exploration. A micro pit is burrowed for harvesting gold, and is later used as tailing storage area during the operation of mining for a nearby patch. In the post-mining phase, if the patch is within the flood plain, the pit will be flooded after remediation. Similar to the bomb craters created during the war, which have been transformed by local people into fish ponds for food, mining pits will hold water for new aquaculture. In contrast, pits above the flood zone will be used for terrace cultivation — these pits will be created either during the mining operation to maximize the south-facing side or by re-sloping after the mining operation. Together with other crops, opium poppy, a major plant which thrives on the land of Laos, are used to create a new remediative regional economy.

“Mining as Demining” re-envisioned gold mining as an incubator for new economies. While the bombing operation during the war was an attempt to destroy the regional infrastructure, “Mining as Demining” sees gold mining as a method

for bringing infrastructure back to the region and a generator of an improved livelihood. Infrastructure, understood as a necessity for the mining operation, is constructed for connectivity and energy production, with amenities such as roads, plants and hydropower dams, as well as other basic civil institutions such as hospitals and schools. Rather than creating a single mega mining pit that requires heavy infrastructure, as typical mining operations do, “Mining as Demining” minimizes the impact through creating micro pits within the boundary of slash and burn patches. It also recycles and redirects material flows, as micro-industries emerge together with bomb and gold harvest. Bombs are collected, sent to local micro-mills, and melted into steel bars for the local construction of micro-hydro dams or bridges. Gold is used not only to pay for demining, or to be exported by international companies, but also for local religious and cultural purposes, becoming a registration of the mining and demining processes.

“Mining as Demining” exploits gold mining companies as landscape architects. Rather than being a major factor of environmental disturbance, mining processes can be reimagined as bomb clearing devices.

Mining operations are reconceived as “digging and reconstructing”, utilizing the by-product of mining processes — pits and overburden materials — as an opportunity to reshape the war-disturbed landscape. Extremely dangerous areas, which are too problematic for bomb removal through humanitarian land sweeping demining processes, are indicated as high risk-dangerous zones by using the overburden construct double berms as barricades. Ironically, these bomb-protected islands will function as bio-conservation areas, prohibiting any further human intervention. They are untouchable patches dispersed in this migrating landscape, indicating a history in forms of protected zones.

The project poses a new linkage between resource extraction and post-war metal cycling economies, strengthening a livelihood that heals the war-scarred landscape. Existing conditions evolve from materials that are recycled and redirected. Bombs are reused, overburden is redistributed. New economies and industries emerge from this shifting ground, simultaneously creating safer land. These processes re-establish an inhabitable landscape of productivity, rather than one of destruction. **LAF**

#### NOTES

- ① In a speech by Tim Horner in 2007, who is the UNDP STA at the UXO National Regulatory Authority (NRA) in Lao PDR, he mentioned that at the current UXO Lao clearance rate, it could take 3,600 years to deal with the cluster munitions still remaining in Lao PDR. See Tim Horner, Speech at the Meeting of the Group of Governmental Experts of the Convention on Conventional Weapons, 2007, Geneva.
- ② Thomas Campanella observes that both the bomb casings and the craters themselves have been made to yield an alternative harvest, in an ingenious replacement of the rice fields they otherwise disrupt. He describes in Laos' next-door Vietnam, the craters that have become fish farms. See Thomas J. Campanella, “Bomb Crater Fish Ponds”, *Places*, Vol. 9, No.3: 48 (Cambridge: MIT Press, 1995).
- ③ Mines Advisory Group (MAG) is an international organization that saves lives and builds futures through the destruction of landmines, unexploded ordnance (UXO), and other weapons remaining after conflict. Since 1989, MAG has worked in over 35 countries and was a co-laureate of the

- Nobel Peace Prize in 1997.
- ④ *Bomb Harvest*, a 2007 documentary directed by Kim Mordaunt, explores the consequences of war in Laos: Unexploded Ordnance (UXO) continues to kill and injure people, and prevent them from using land, including growing food. Ironically, the poverty has driven the locals to search for another form of income and the new cash crop has become bomb scrap metal.
- ⑤ According to the Annual Mine Report (DOM, Lao PDR), Laos has a total of 572 mining deposits and prospects, 47% of which were found to contain gold, copper, lead and/or zinc. As of October 2008, there are 127 domestic and foreign companies (213 projects) involved in the prospecting period, exploration period and feasibility study period. 42 companies are domestic investors and 85 companies are foreign investors from China, Vietnam, Thailand, Australia, Russia, Republic of Korea, DPRK, Canada, England and Poland. See Department of Mines (DOM), “Annual Mine Report 2008”.
- ⑥ Yayoi Fujita Lagerqvist gives a brief history of land use

- changes in Laos. Extensive trade in forest products played an important role in ancient Laos. During the civil war years, heavy bombing and disruption induced a massive exodus of rural people from the eastern to the western part of the country, resulted in makeshift villages, clearing forest, expanding areas of shifting cultivation and, eventually, initiating the development of secondary forest. The Post-war era started with widespread degradation of forests throughout the country, which was caused by the lack of responsible resource management. See Yayoi Fujita Lagerqvist, “Understanding the History of Change in Laos: An Important Premise for Development Efforts”, *Mountain Research and Development*, Vol. 26, No.3: 197-199, 2006.
- ⑦ Slash and burn agriculture is a traditional method of cultivation in Laos that involves the rotation of several plots of land in a planting cycle. The farmer plants crops in a field for one or two seasons then shifts to a field that has lain fallow for several years, and removes the vegetation by cutting it down and burning it.